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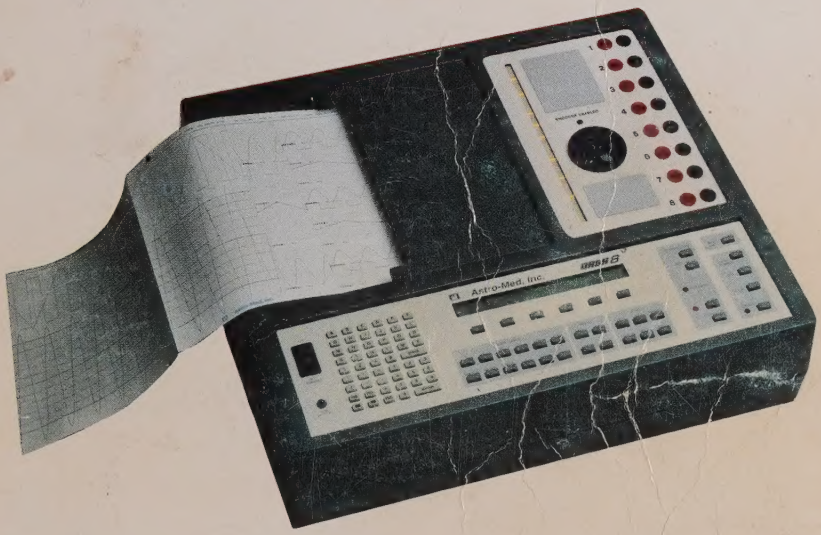

DASH 8

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Operations *and* Maintenance Manual

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DASH 8
Operations and Maintenance Manual

Astro-Med, Inc.
Part Number 22834-008

second edition
November 1992

Serial Number _____

Issued to _____

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Limited Warranty

Astro-Med warrants all portions of this hardware product against defects in materials or workmanship for a period of one year from the date of original purchase. If you discover a defect, Astro-Med will, at its option, repair or replace this product at no additional charge except as set forth below. Repair parts and replacement products will be furnished on an exchange basis and will be either reconditioned or new. All replaced parts become the property of Astro-Med.

This warranty does not apply if the product has been damaged by accident abuse, misuse, or misapplication; or has been modified without the written permission of Astro-Med.

To obtain warranty services, send your product, freight prepaid, to our factory at: Astro-Med Industrial Park, West Warwick, Rhode Island, 02893. Call (401) 828-4000 for further information. Astro-Med is not responsible for your product if it is lost or damaged in transit.

Astro-Med makes no warranty, either express or implied, with respect to this products fitness for a particular purpose.

828-4000

Recorder Identification Data

Congratulations. Your Astro-Med purchase is an investment in the finest of state-of-the-art chart recorder technology. The information below lists the model number, serial number, and software version number of your chart recorder. Verify that the software configuration number (SCN) that appears on the display of your chart recorder after it has been powered-up exactly matches the software version given below. The software version recorded below is the most current software version available for your chart recorder. As noted below, the software version number represents the software as originally installed in your instrument. Any upgrades of the chart recorder's resident software should be noted in the space provided. If, for any reason, it should be necessary for you to contact Astro-Med regarding your purchase, please refer to the following:

Model Number: _____

Serial Number: _____

Software Version: _____
(original installation)

Upgraded Software Version: _____
(date installed:)

Upgraded Software Version: _____
(date installed:)

Declaration of Conformity | Ubereinstimmungserklärung
Declaration de Conformite | Dichiarazione di Conformità

Application of Council Directive
Application de la Décisions du Conseil
Anwendbar für die Richtlinie(n)
Applicazione della/e Direttiva/e del Comitato
} 84/539/EEC

Standard to which conformity is declared
Standard auquel la conformité appartient
Norm(en) für welche Übereinstimmung erklärt wird
Norma/e fer la/e quale/i si dichiara la conformità
} IEC 601-1

Manufacturer's name
Nom du fabricant
Hersteller
Nom del costruttore
} Astro-Med, Inc.

Model no.
Modèle N°.
Model Nr.
Modello no.
} DASH 8

Manufacturer's address
Adresse du fabricant
Anschrift des herstellers
Indirizzo del costruttore
} 600 E. Greenwich Ave.
West Warwick, RI
02893
USA

Serial no.
N° de série
Serien Nr.
No. di serie
} _____

Type of equipment
Type d'equipement
Beschreibung des Gerätes
Tipo di apparecchio
} printer / plotter

year of manufacture
année de fabrication
herstellungsjahr
anno di costiruzione
} _____

I, the undersigned, hereby declare that the equipment specificied above conforms to the the above Directive and Standard.

Je, Soussigné, déclare que l'équipment spécifié ci-dessus est en conformité avec la directive et le standard ci-dessus.

Ich, der unterzeichnende erkläre hiermit, daß das oben beschriebene Gerät den vorgenannten Richtlinien und Normen entspricht.

Il sottoscritto dichiara che l'apparecchio sopra specificato è conforme alla/e Direttiva/e e Norma/e.

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Introduction 1

Recorder Setup

1-1 Introduction

This manual provides the information required to operate and maintain the Astro-Med DASH 8 eight-channel field recorder as a stand-alone instrument. Control of the recorder through a remote host computer is discussed in the DASH 8 Host Control Manual.

The DASH 8 takes its place as the newest of Astro-Med's innovative New Technology chart recorders. Integrating high-density thermal printing, programmable memory, proprietary software, and solid state design, Astro-Med New Technology instruments achieve unprecedented versatility and reliability.

In our New Technology chart recorders, pens, pen motors, and virtually all other moving parts are eliminated. Using a fixed thermal printhead and 12-bit A/D data processing, the DASH 8 records very high frequency waveforms with unrivaled accuracy and resolution.

1-1

Introduction (continued)

Completely designed and built in the United States, the DASH 8 is fully backed by Astro-Med's one-year warranty on both parts and labor.

The DASH 8's 200 dots-per-inch resolution and thermal printing technology ensures that recordings are always smooth, clear, and accurate. Viewing of data is immediate.

During recording, the DASH 8 prints a System Log along the left edge of the chart. Invented by Astro-Med, the System Log automatically notes the exact time and date, the current time scale in ms/mm, and the current recording mode.

The DASH 8 has an unexcelled real-time frequency response range of DC to 25 kHz. Frequency response is maintained without distortion, without reduction in amplitude, and without phase shift regardless of the selected sample rate.

Traditional knobs and dials are completely absent from the DASH 8's front-panel controls. Instead, a well organized and convenient array of soft-touch pushbutton controls is provided. These pushbutton controls are referred to as "keys" throughout this manual.

A GPIB (IEEE-488) port on the recorder's rear-panel provides the connection that enables a host computer to control most of the DASH 8's recording activities.

Built for travel, the DASH 8 weighs 28 pounds with its battery pack and fits beneath most airline seats. The DASH 8's almost indestructible plastic case makes this one portable recorder that withstands the rigors working in field environments.

1-2

To begin real-time recording right now

1. Examine the DASH 8's condition and verify that no obvious shipping damage has occurred.

2. Examine the recorder's rear panel and verify that the recorder is set to the line voltage that you need — either 120VAC or 240VAC. The voltage has been factory-set to your requirements and should not need immediate adjustment.

3. Connect the recorder's AC power cord first to the rear panel power input receptacle and then to a power outlet.

4. Load the recorder with the pack of Astro-Med roll thermal paper.

   - Press the paper compartment door release to open the door.
   - Load the recorder with the roll thermal paper that has been supplied. The paper compartment is located to the left of the DASH 8's light bar. Insert the roll so that the paper unwinds from the bottom of the roll. Pull out about six inches of paper. Close the paper compartment door.

5. Push the recorder's power switch to the "ON" position. Recording automatically begins in the format and mode used during the last recording activity. If an error message is displayed, call Astro-Med's service department at (401) 828-4000.

6. Connect one or more signal sources to the front-panel analog-input banana-jack connectors.

7. Press the front panel [AUTO RANGE] key.

8. If necessary, use the [MODE] key to select the recording format that you desire.

1-3

Standard features

- DC to 25 kHz bandwidth
- 200 dot/inch printhead resolution
- 200 mm/second chart speed
- Nine event markers: switch closure or TTL activated
- System Log

  automatic printing of time, date, speed, time base, and operating mode
- Self-printing HELP sheets
- Real-time recording Modes

  - continuous real-time recording
  - timed recording
  - timed dual-speed recording
  - triggered dual-speed recording
  - datalogger recording
- Overlap Modes

  - 4 GRID mode: four channels each containing two waveforms
  - 2 GRID mode: two channels each containing four waveforms
  - 1 GRID mode: one channels containing eight waveforms
  - USER mode: inherent user-configured overlap capability
- ID pushbutton to identify waveform channel
- Three programmable insta-speeds
- Three programmable system setups

1-3

Standard features (continued)

- Alphanumeric printing

  - System Log
  - eight text buffers each with 128 character spaces
  - on-demand 128-character text buffer
  - channel ID
  - gain settings printed automatically in text buffers

- Remote Start / Stop

  permits external start/stop of recorder from TTL-low or switch closure

- Grid selections

  -eight individual waveform channels
  -six individual waveform channels
  - four channels each containing two waveforms
  - two channels each containing four waveforms
  - one channels containing eight waveforms
  - USER mode: any combination of waveform channels from 12mm to 175mm wide with or without grids placed any where on the chart

- GPIB (IEEE-488) multi-user interface

- eight separate A/D converters, 250 kHz/channel real-time sample rate, front panel gain selection, host programmable

- Start-up kit with one roll of thermal chart paper

- Operations and Maintenance manual

- AC power cord

1-4

Specifications

dimensions	15½" (394 mm) deep x 17 ½" (445 mm) wide x 4¼" (108 mm) high
weight	28 pounds (13 kg) with battery pack
recording method	direct-writing. resolution: 200 dots/inch (12 dots/mm)
paper	low-cost, permanent, black-imaging roll thermal paper
paper dimensions	8½" wide by 150' long 216 mm x 46 m
number of channels	8 channels maximum user-selectable 6-, 4-, 2-, and 1-channel modes
event markers	9: activated by switch closure or TTL pulse
alphanumeric printing	■ System Log ■ eight text buffers each with 128 character spaces ■ on-demand 128-character text buffer ■ channel ID ■ gain settings printed automatically in text buffers
System Log	automatic printing of time, date, speed, time base, and operating mode
timing marker	trilevel timing marker

1-4

Specifications

frequency response	DC to 25 kHz within 3 dB, mean bandwidth DC to 20 kHz within 3 dB in high gain ranges
amplitude resolution	200 dots per inch 8 dots per mm
time axis resolution	400 dots per inch to 100 mm/s 200 dots per inch from 101 to 200 mm/s
chart drift	None. Chart and waveform printed simultaneously.
chart formats	■ standard 8-, 6-, 4-, 2-, 1-channel ■ user grid any combination of waveform channels from 12mm to 175mm wide with or without grids placed anywhere on the chart
grid selections	■ major divisions ■ major divisions and minor divisions ■ grid printing on / off ■ time line synchronization to internal timer
chart speeds	1, 5, 25, 50, 100, and 200 mm/sec, mm/min, mm/hr every integer form 1 to 200 mm/sec, mm/min, mm/hr

1-4

Specifications (continued)

channel identification	numerical identification of waveform channels via front panel button
system setup storage	3 system setups stored for later retrieval. Nonvolatile. Setups retained upon power loss.
timing marks	when selected, trilevel event marker displayed on right-edge event marker at intervals of either: ■ 0.01-, 0.1-, 1-second ■ 0.1-, 1-, 10-second
measurement range	50 mV full scale to 500 V peak full scale
maximum input	500 V peak or DC 250 V rms mode
input type	either: ■ differential balanced to common ■ isolated
common mode voltage	for non-isolated: ■ 10 V for ranges less than 10 V full scale ■ 500 V for ranges above 10 V full scale for isolated: ■ 500V for all ranges
common mode rejection (60 Hz)	80 dB

1-4

Specifications (continued)

input impedance	2M
non-linearity	less than 0.1% of full scale
gain error	less than 0.5% of full scale
gain drift	less than 0.5% of full scale (to 40° C)
intrinsic noise	less than 1.0% of full scale
zero suppression	maximum of ±10 V for ranges up to 5 V full scale maximum of ±500 V for ranges up to 500 V full scale
A/D converter	12 bit. One per channel.
sample rate	250 kHz maximum per channel
low pass filter	10 Hz
measurement mode	true rms or peak-to-peak
RMS crest factor	greater than 8 at 1%
RMS gain error	less than 2% full scale
data capture module (optional)	■ sample rates 250 kHz, 100 kHz, 50 kHz, 10 kHz, 5 kHz, 1 kHz 500 Hz, 100 Hz

1-4

Specifications (continued)

data capture module (optional)

- mode

  single or stacked

- events

  maximum of 8 independent, nonvolatile captures saved per channel

- capacity

  32 kSamples per channel in single acquisition mode

  eight 4 kSample segments per channel in stacked mode

- trigger

  any combination of waveform, host, manual, periodic, or external switch closure / TTL

- waveform trigger

  Window trigger. High and low levels for each channel independently set.

- trigger level accuracy

  2% of full scale

- Playback mode

  any real-time mode and X-Y plot

1-4

Specifications (continued)

data capture module (optional)

- playback factor

  expansion or compression of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4

connectors

- input

  guarded banana jacks

- host

  GPIB (IEEE 488)

- other

  - utility port to access event channels
  - remote chart drive
  - remote start / stop
  - external trigger

remote control

- start / stop

  standard; activated by switch closure

- chart drive

  activated by external TTL pulse

HELP sheets

[HELP] key used to obtain:

- QUICK START GUIDE TO OPERATION
- GENERAL KEYPAD INFORMATION
- DASH 8 STATUS REPORT

1-4

Specifications (continued)

standard modes

- real-time waveform recording
- Datalogger recording
- line printer
- X-Y plot

environmental requirements

- operating temperature

  0 to 40° C / 32 to 104° F

- humidity

  5 to 95% relative humidity

power requirements

- 120/240 VAC
- 50/60 Hz
- external 11 to 18 VDC

recall section

[SAVE], [1], [2], [3] keys store and recall any of three complete system setups

menu section

[SPEED] key specifies any desired chart speed.

[TIMER] key selects the timing mark interval.

[TRIGGER] key specifies all trigger condition parameters.

[SYSTEM] key specifies all system setups, e. g., channel order, time, date, etc.

[MODE] key selects the operating mode.

[EDIT] key edits the interchannel text buffers.

1-4

Specifications (continued)

channel section

[ZERO AND GAIN SET-UP] key calls up the menu to specify range, zero suppression, rms mode, peak-to-peak mode, or signal grounding for all channels

[AUTO RANGE] key automatically adjusts gain to present input signal at full scale on the grid

ACQUIRING LED illuminates during data capture acquisitions

[ARM] key activates background data capture to enable data acquisitions even when recording in any real-time mode

[CHANNEL ID] key causes immediate printing of appropriate channel number on each waveform.

operation section

[RUN/HALT] key stops printing or restarts printing.

[PAPER ADVANCE] key, when pressed, moves paper through recorder.

[HELP] key calls up a menu through which any of three HELP or STATUS sheets can be immediately printed. These help sheets are: QUICK START GUIDE TO OPERATION, GENERAL KEYPAD INFORMATION, and a DASH 8 STATUS REPORT that gives full system status information on either the active system setup or any of three user-defined, stored system setups.

1-4

Specifications (continued)

operation section (continued)

[EVENT] key causes left system event marker to deflect to the left to mark data of interest. Marker returns to the right when key is released.

[TRIGGER] key is a front panel mechanism for manually triggering a data capture snapshot or dual speed recording. Associated LED illuminates when a valid trigger occurs.

1-5

Options

DC-85	**Data Capture**	provides 32 kSamples of memory per channel; internal
BP-80	**Battery Pack**	internal battery; charged during AC operation
EP-28	**External Power**	permits operation from external 22 to 44 VDC; replaces battery pack
TC-10	**Thermocouple Input Modules**	Provides E, J, K, and T thermocouple types

1-5

Options

CC-80	**Carrying Case**	soft sided carrying case with pockets to accommodate manuals and cables
AN-85	**Padded Transport Case**	rigid construction, reusable recorder case

1-6

Preparation

After you have unpacked the DASH 8, examine the recorder's condition and verify that no obvious shipping damage has occurred.

In addition to the DASH 8 itself, you should find the following items:

- This DASH 8 Operations and Service Manual
  One power cord (stored within the recorder's top cover)

  No power cord is furnished for shipments outside the United States due to varying power requirements between countries.

- One roll of Astro-Med thermal paper

- One 3-contact auxiliary power plug for use with the external input 11-16 VDC connection

1-6

Preparation (continued)

- One 15-pin D-shell connector for use with the recorder's rear-panel UTILITY input (cable supplied by customer)

The DASH 8 can be operated using any of four power sources:

- line voltage

  120 VAC, 50/60 Hz
  240 VAC, 50/60 Hz

- external 11 - 18 VDC

  (requires the 3-contact plug supplied for use with the recorder's external 11 - 18 VDC receptacle)

- optional, internally-mounted, 12-volt rechargeable NiCad battery pack

- optional, external 22 - 32 VDC
  (replaces optional battery pack)

Before connecting your DASH 8 to any line-power outlet, locate and examine the rear-panel power input receptacle / voltage selection box to verify that the recorder is set to the line voltage applicable to your needs - either 120 VAC or 240 VAC. The appropriate voltage has been factory-set to your requirements and should not need immediate adjustment. If you should desire to change the DASH 8's operating voltage, refer to the line-voltage selection procedure on the following page.

1-6.1 Changing the recorder's line-voltage setting

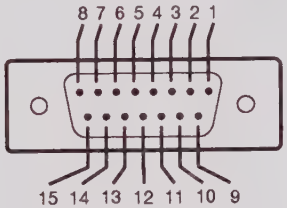
1 On the recorder's rear panel, locate the power input receptacle / voltage selection box.

2 With a small flat-head screw driver, open the fuse block/voltage selection box.

3 Remove the cylindrical voltage indicator from the voltage selection box and orient the indicator to match the operating voltage that you are selecting. Reinsert the voltage indicator and close the fuse block/voltage selection box.

1-6.2 Wiring the UTILITY D-shell connector

If you intend to control aspects of recorder operation remotely, you will need to use the 15-pin D-shell connector provided for use with the DASH 8's UTILITY D-shell receptacle. Pin connections for the D-shell are shown in the illustrations below. A pin table for the D-shell is provided on the next page.



UTILITY D-shell connector pin table

Pin	Description
1	Event 1
2	Event 2
3	Event 3
4	Event 4
5	Event 5
6	Event 6
7	Event 7
8	Event 8
9	External Trigger
10	External Speed
11	Remote Start/Stop
12	Ground
13	no connection
14	no connection
15	System Event

1-6.3 Using the GPIB (IEEE-488) D-shell connector

The GPIB D-shell connector is the IEEE communications interface between the chart recorder and various host-computer configurations. Control of the chart recorder by host computer is documented in the DASH 8 Host Control Manual. Pin connection data for the GPIB D-shell connector are provided below.

GPIB D-shell connector pin table

Pin	Description	Pin	Description
1	DIO1	13	DIO5
2	DIO2	14	DIO6
3	DIO3	15	DIO7
4	DIO4	16	DIO8
5	EOI	17	REN
6	DAV	18	GROUND (6)
7	NRFD	19	GROUND (7)
8	NDAC	20	GROUND (8)
9	IFC	21	GROUND (9)
10	SRQ	22	GROUND (10)
11	ATN	23	GROUND (11)
12	SHIELD	24	GROUND LOGIC

GROUND (X) = the signal ground return of the referenced contact.

Operation 2

2-1

What is discussed in this section

The basic DASH 8 is a real-time recorder. All information regarding operation of the recorder's data capture and playback capabilities presupposes that the Data Capture and Playback option (DC-85) has been installed in the recorder.

Operation of the DASH 8 is discussed in the sequence that follows.

Helpful preset recorder functions that you can use right away

- initial operation in last recording mode
- printing recorder help sheets
- halting and resuming recording
- changing recording speeds
- performing a recorder self-calibration

2-1

What is discussed in this section (continued)

Identifying front and rear panel features

- front panel features
- rear panel features

Preparing to record data

- specifying the recorder's signal conditioner settings
- specifying the settings of the system setups
- storing and recalling system setups

Recording data in real-time

Capturing and replaying data

- defining data-capture trigger conditions
- using the DATA CAPT mode
- using the PBACK mode

Making the chart look like you want it to look

- editing annotation in the interchannel buffers
- using the on-the-demand annotation buffer
- shifting waveforms within their channels
- changing the order in which the channels are printed
- grounding waveforms
- labeling each waveform with a channel identification number
- continuous printing of channel ID numbers
- using the recorder's over-range feature
- using event marker's to mark data of interest
- printing timing marks on the grid
- synchronizing the System Log caret to an internal or external time source

2-1

What is discussed in this section (continued)

Performing a software upgrade

2-2

Helpful preset recorder functions

The DASH 8 has numerous features that help to make basic real-time recording quick and astonishingly easy. These preset functions include:

- initial operation in last recording mode
- printing recorder help sheets
- halting and resuming recording
- changing recording speeds
- performing a recorder self-calibration

To get you immediately into the operation of your recorder, each of these capabilities is explained below.

2-2.1 Initial operation in last recording mode

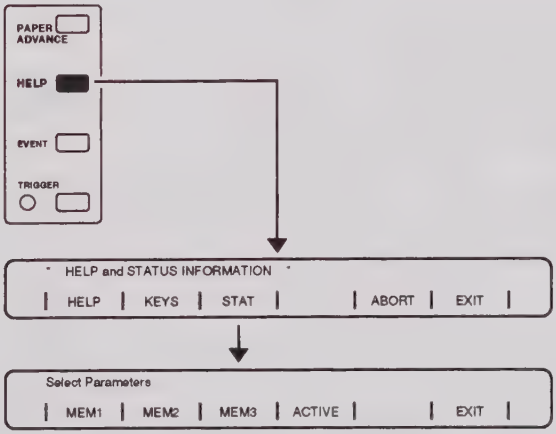
When it is turned on, the DASH 8 automatically begins recording in the last mode in which it was operating. If you change operating modes only infrequently, the cumulative affect of this feature can save you considerable setup time.

2-2.2 Printing recorder HELP sheets

First of all, always keep in mind that if you become confused or forgetful as you use your recorder, the DASH 8 can give you a great deal of both basic operational information and information regarding recorder settings.

HELP information comes in the form of any of three automatically generated HELP sheets. You use the front-panel [HELP] key to get a printout of the information you want. HELP sheets include:

- QUICK START GUIDE TO OPERATION
- GENERAL KEYPAD INFORMATION sheet
- STATUS REPORT



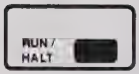
Pressing the soft key beneath HELP results in the immediate printing of a QUICK START GUIDE TO OPERATION.
The QUICK START GUIDE TO OPERATION outlines ten different areas of recorder operation ranging from changing recorder modes to general system setup.

2-2.2 Printing recorder HELP sheets (continued)

Pressing the soft key beneath KEYS results in the immediate printing of a GENERAL KEYPAD INFORMATION sheet. The GENERAL KEYPAD INFORMATION sheet shows the front-panel layout and explains the function of every soft key.

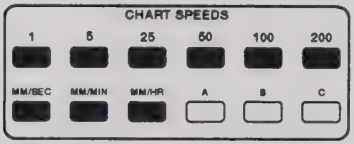
Pressing the soft key beneath "STAT" invokes the menu used to specify printout of current system setup parameters or the parameters of any of the three system setups stored in the RECALL Group's MEM keys. The STATUS REPORT sheet lists all recorder parameters of either the active system or any of the three system setups that the recorder can store in memory.

2-2.3 Halting and resuming recording



Pressing the [RUN / HALT] key halts and reinitiates recorder printing. Use the [RUN / HALT] key when you want to pause the recorder or resume printing after the recorder has been paused.

2-2.4 Changing recording speeds



Use the keys of the CHART SPEEDS group to instantly select any of six speeds.

2-2.4 Changing recording speeds (continued)

The keys of the top row of the CHART SPEEDS group are labeled 1, 5, 25, 50, 100, and 200 indicating six speeds.

The [MM/SEC], [MM/MIN], and [MM/HR] keys of the bottom row are used to select the speed range: millimeters per second, minute, or hour.

The [A], [B], and [C] keys of the bottom row are individually programmable "insta speed" keys. To program the [A], [B], and [C] keys, refer to the discussion of the INSTA SPDS setup within the overall explanation of the [SYSTEM] key.

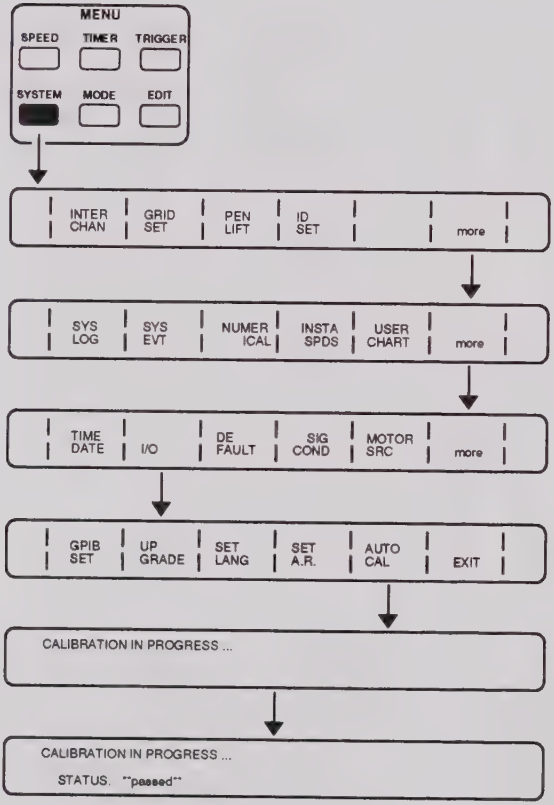
When you are recording in real-time and you press any speed or insta-speed key, the selected speed is immediately used. The previous speed is lost.

2-2.5 Performing a recorder self-calibration

The DASH 8 can calibrate itself on demand with a precision traceable to the requirements of the United States Institute of Standards and Technology (NIST).

Press the front-panel [SYSTEM] key and go to the "AUTO CAL" function of the "I/O" setup any time you want the recorder to perform a self-calibration. The menu flow is shown on the opposite page.

2-2.5 Performing a recorder self-calibration



FRONT PANEL: DASH 8

1 power ON/OFF switch

2 paper-chamber door release

3 paper chamber door

4 front-panel display

5 light bar

6 encoder enabled LED

7 encoder wheel

8 signal-input banana jacks

9 operation section

10 channel section

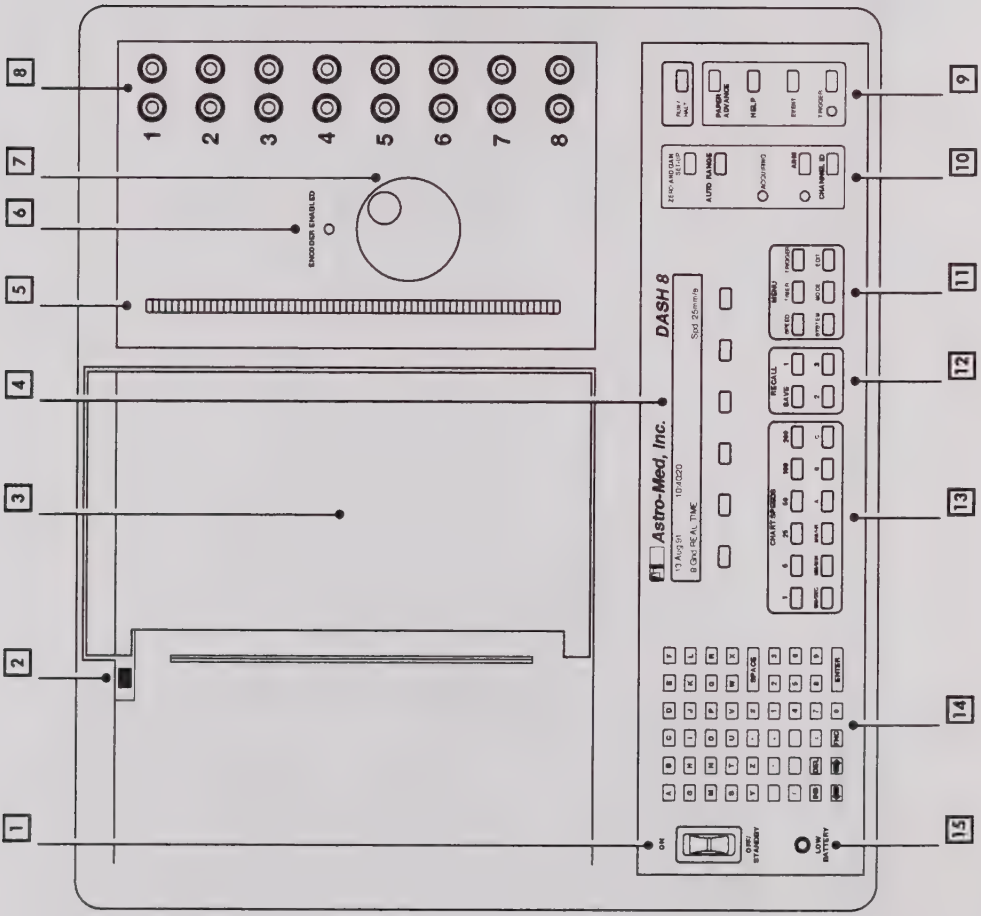
11 menu section

12 recall section

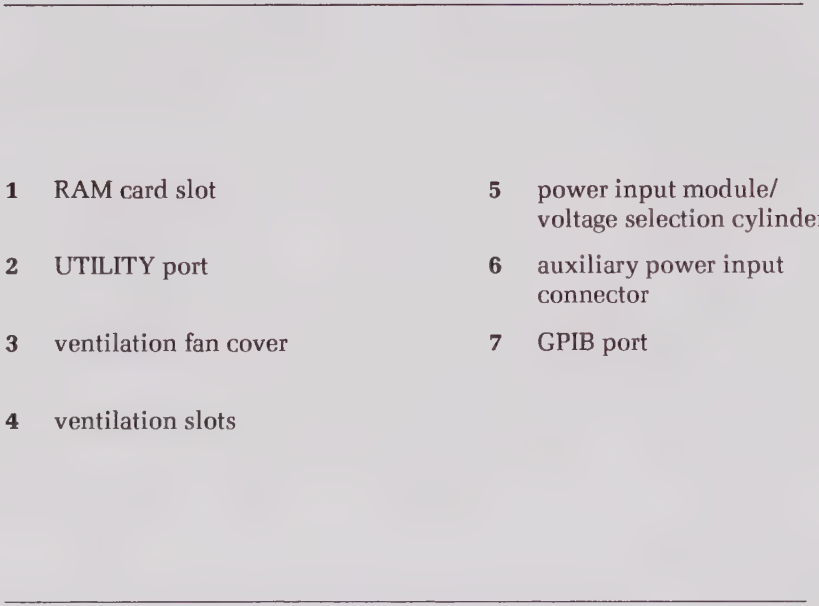
13 CHART SPEEDS group

14 alphanumeric keypad

15 tri-color LOW BATTERY LED


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
DASH 8
Astro-Med, Inc.
ON
LOW BATTERY
ENTER

REAR PANEL: DASH 8



1 RAM card slot

2 UTILITY port

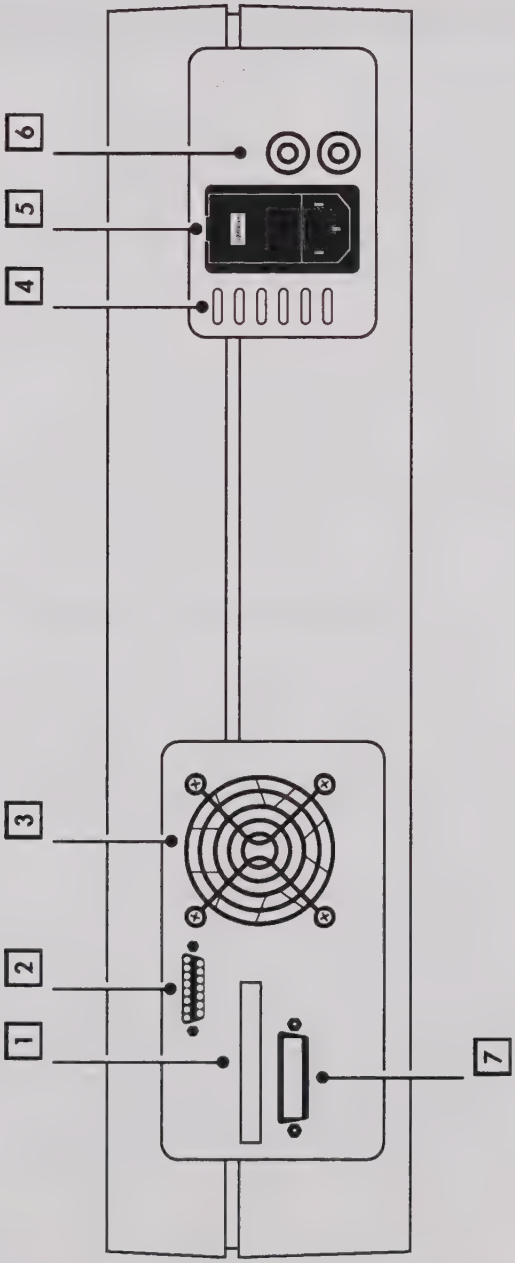
3 ventilation fan cover

4 ventilation slots

5 power input module/ voltage selection cylinder

6 auxiliary power input connector

7 GPIB port


6
5
4
3
2
1
7

2-3

Preparing to record data

After you have physically prepared your DASH 8 for recording and established your signal input connections, you will want to go on to recording data. The DASH 8 also needs some programming preparation to record data in the format you want. Specifically, this recorder preparation includes:

- specifying the recorder's signal conditioner settings.
- establishing system parameter setups.

The following paragraphs discuss these aspects of recorder preparation including storing and recalling system setups.

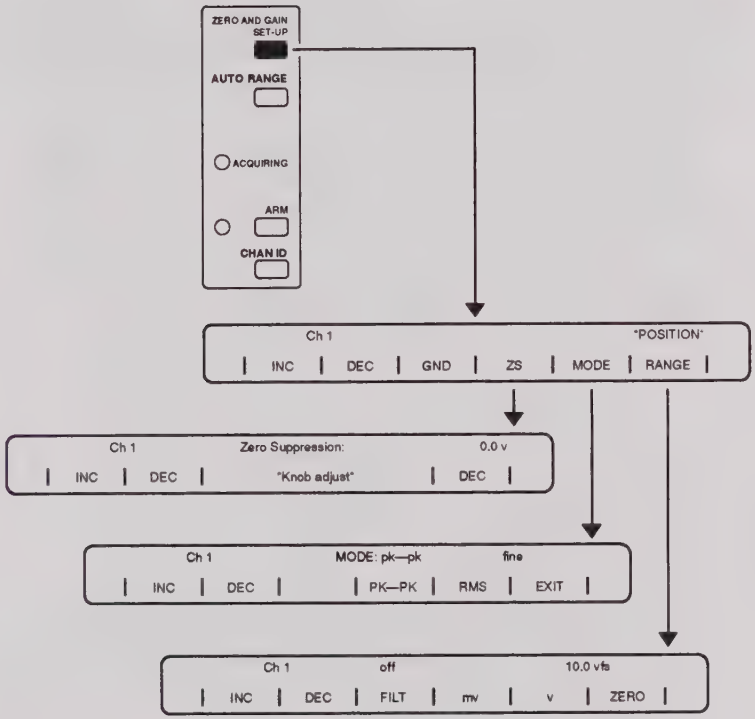
2-3.1 Specifying the recorder's signal conditioner settings

The DASH 8's built-in signal conditioners "talk," that is, they automatically report their gain and position settings in the channel's annotation butter. Generally, the last forty character spaces of the buffer are used for this purpose.

The [ZERO AND GAIN SET-UP] key calls up menus used to:

- select a channel to be adjusted (INC / DEC)
- ground or accept the channel's input signal (GND)
- define a zero suppression setting for the selected channel (ZS)
- choose either a peak-to-peak or rms recording mode
- define the full-scale voltage range for the selected channel
- enable or disable the recorder's 10 Hz low pass filter

2-3.1 Specifying the recorder's signal conditioner settings (continued)



When pressed, the "GND" parameter grounds the selected waveform signal on the chart. The "GND" menu choice blinks continuously when it has been selected.

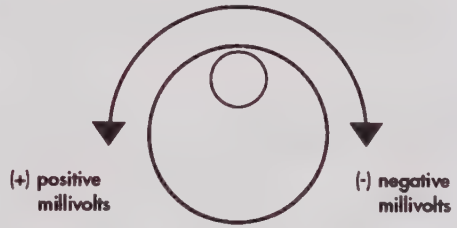
The "ZS" parameter is used to choose a zero suppression setting to be applied to the selected input signal. Zero suppression is selectable from +10 V to -10 V in 0.005 mV increments. The DASH 8's encoder wheel is used to quickly specify the desired zero suppression factor.

2-3.1 Specifying the recorder's signal conditioner settings (continued)

When "ZS" has been pressed, the ENCODER ENABLED LED illuminates to indicate that the encoder wheel is active. The zero suppression menu also references you to the encoder wheel (knob adjust).

As the encoder wheel is turned to the right, the zero suppression voltage is *decremented* in -0.005 mV units.

As the encoder wheel is turned to the left, the zero suppression voltage is *incremented* in +0.005 mV units.



The "**MODE**" parameter is used to select between either peak-to-peak recording or root-mean-square recording.

The "**RANGE**" parameter is used to

- enable or disable the recorder's 10 Hz low pass filter.
- select a full scale operating voltage in either volt or millivolt increments.

When pressed, the "FILT" parameter toggles between "on" and "off" either enabling or disabling the filter.

2-3.1 Specifying the recorder's signal conditioner settings (continued)

The full-scale voltage range can be specified in either millivolts or volts. The selection is made by pressing the soft key beneath either "mv" or "v."

The millivolt range is from 50 mV to 5000 mV in the following increments.

voltage range	incremental unit
5 mV - 200 mV	1 mV
200 mV - 500 mV	2 mV
500 mV - 1000 mV	5 mV
1000 mV - 2000 mV	10 mV
2000 mV - 5000 mV	20 mV

The volt range is from 5 V to 500 V in the following increments.

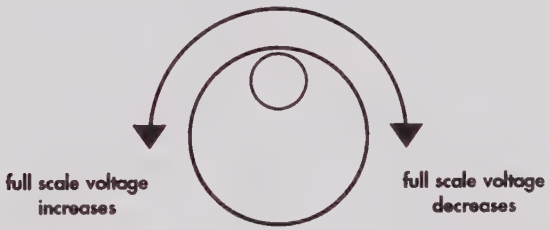
voltage range	incremental unit
5 V - 20 V	0.1 V
20 V - 50 V	0.2 V
50 V - 100 V	0.5 V
100 V - 200 V	1 V
200 V - 500 V	2 V

2-3.1 Specifying the recorder's signal conditioner settings (continued)

When the desired voltage unit has been chosen, the encoder wheel is used to set the full-scale voltage.

As the encoder wheel is turned to the right, the full scale voltage is *decremented* in accordance with the voltage tables provided on the preceding page.

As the encoder wheel is turned to the left, the full scale voltage is *incremented* in accordance with the voltage tables provided on the preceding page.



2-3.2 Specifying the settings of the system setups

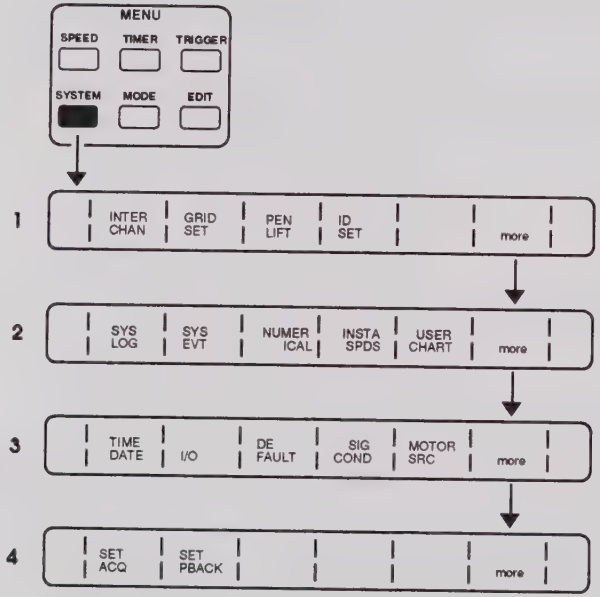
The front panel [SYSTEM] key is used to define all system setups. System setup parameters determine how charts produced by the DASH 8 look and how the recorder will behave during certain operating modes. For instance, using system setup parameters, you can turn the grid on or off, rearrange the order of the channels, prepare to capture or to replay data, print waveform data as numeric values, and much more. Taken as whole, system setup parameters form a full system setup.

System setup parameters can be changed at any time during real-time operation.

2-3.2 Specifying the settings of the system setups

(continued)

Parameter selections are made by pressing the soft keys beneath the DASH 8's front-panel LCD display. When a soft key is pressed, the parameter selection is immediately used.



NOTE

The Data Capture option (DC-85) adds system setup menus that are not present in DASH 8 recorders which lack this option. The information presented on the following pages is based on a recorder with the Data Capture option installed. If the menus shown on your recorder do not exactly match the menus discussed below, your recorder lacks the Data Capture option. You should simply disregard system setups that do not pertain to your chart recorder.

2-3.2 Specifying the settings of the system setups

(continued)

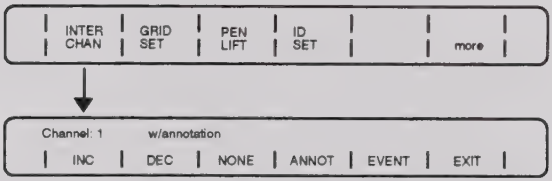
Each system setup parameter is listed below. Each parameter is discussed in the paragraphs that follow.

- INTER CHAN setup
  (interchannel annotation / event markers)
- GRID SET setup
  (grid on/off, minor divisions on/off, grid synchronization)
- PEN LIFT setup
  (printing on/off)
- ID SET setup
  (automatic, continuous printing of channel ID number)
- SYS LOG setup
  (printing of system event marker / System Log on/off)
- SYS EVT setup
  (printing of system event marker / System Log on/off)
- NUMERICAL setup
  (conversion factors for numeric recordings)
- INSTA SPDS setup
  (speed values of [A], [B], [C] insta speed keys)
- USER CHART setup
  (user control over annotation, waveform size/placement, grid on/off, and minor divisions on/off)
- TIME DATE setup
  (recorder clock and calendar)

2-3.2 Specifying the settings of the system setups
(continued)

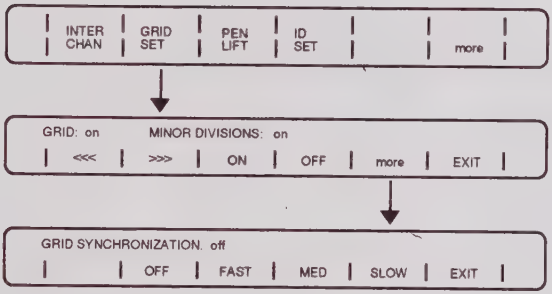
- I/O setup
  (GPIB address/terminator and software upgrades)
- DEFAULT setup
  (system parameter default values)
- SIG COND setup
  (signal conditioner status reporting)
- MOTOR SRC setup
  (motor clock speed control)
- SET ACQ setup
  (data acquisition conditions)
- SET PBACK setup
  (format of data playback)

2-3.2.1 INTER CHAN setup



The INTER CHAN setup is used either to print or suppress annotation or event markers in the interchannel buffers. For the selected buffer, "ANNOT" causes annotation to be printed. "EVENT" causes event markers to be printed.

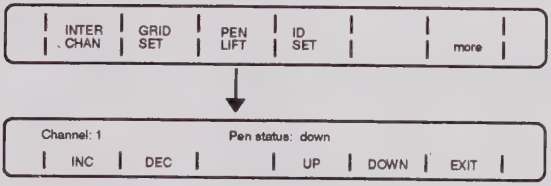
2-3.2.2 GRID SET setup



The GRID SET setup is used to:

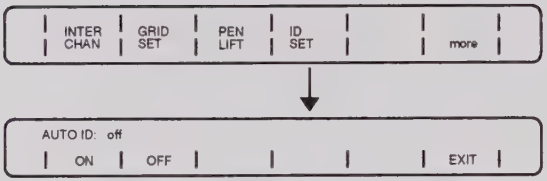
- enable or suppress grid printing.
- enable or suppress printing minor divisions on the grid.
- synchronize the grid to the recorder's internal clock.

2-3.2.3 PEN LIFT setup



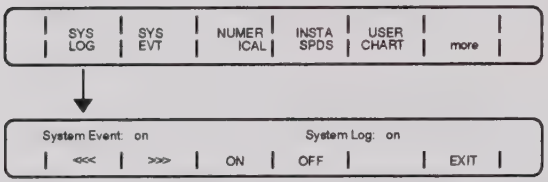
The PEN LIFT setup is used to enable or suppress the printing of individual channels.

2-3.2.4 ID SET setup



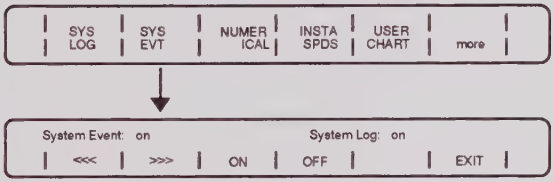
The ID SET setup enables or suppresses automatic and continuous printing of channel identification numbers in the first portion of every interchannel buffer each time the buffer is printed.

2-3.2.5 SYS LOG setup



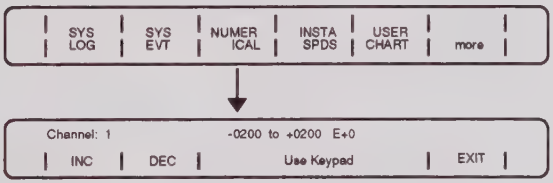
The SYS LOG setup is used to enable or suppress the printing of the system event marker or the System Log.

2-3.2.6 SYS EVT setup



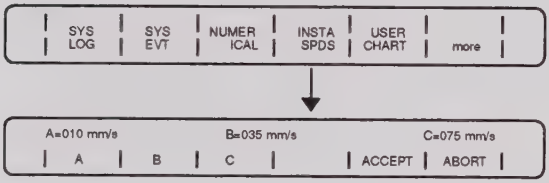
The SYS EVT setup is used to enable or suppress the printing of the system event marker or the System Log.

2-3.2.7 NUMERICAL setup



The NUMERICAL setup specifies the conversion factors used when recording in the Datalogger mode. The conversion factors represent the values of the left and right edges of the waveform in the selected channel. These values are used to convert the waveform data into tabular numeric columns of data. The editable parameters of this display include the channel number, the left and right edge values, and an exponent value (E) which is constrained to whole numbers from -4 to +4.

2-3.2.8 INSTA SPDS setup



The INSTA SPDS setup is used to program the [A], [B], and [C] insta-speed keys of the CHART SPEEDS group. Insta-speed keys provide instant access to any valid speed that you commonly use but that is not immediately available through the CHART SPEEDS group.

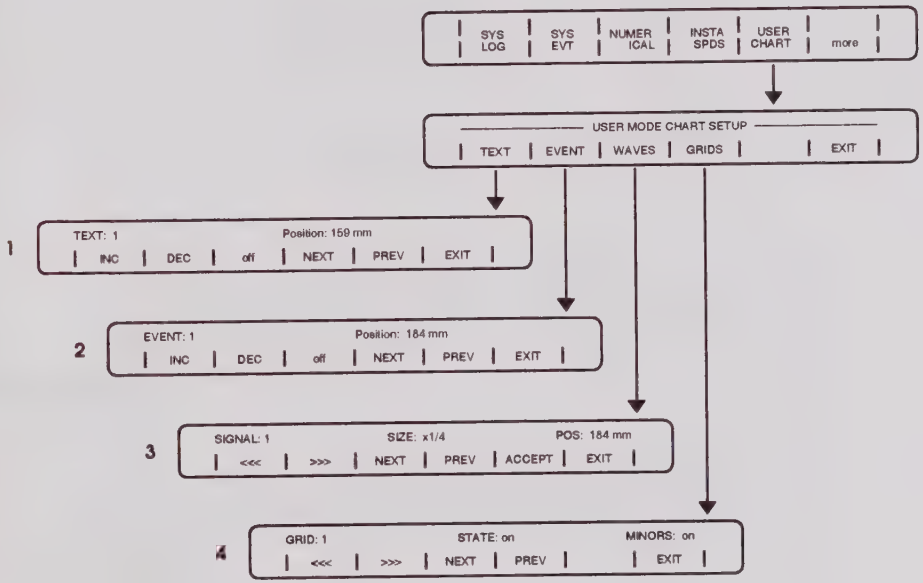
Pressing "A," "B," or "C" selects the first digit of the key's currently displayed speed for editing. Use the arrow keys of the alphanumeric keypad to select the remaining digits of the displayed speed.

Use the number keys of the alphanumeric keypad to change the selected (blinking) digit.

Use the [MM/SEC], [MM/MIN], [MM/HR] keys of the CHART SPEEDS group to change the displayed speed range.

Press "ACCEPT" to store the programmed speed in the selected insta-speed key.

2-3.2.9 USER CHART setup



The USER CHART setup is one of the most powerful setups available in any chart recorder. Using the USER CHART setup, you have total flexibility in designing custom grids to meet the unique requirements of every recording situation. Specifically, the USER CHART setup allows you to:

- disable, enable, or position the selected interchannel text buffer in any of 200 positions across the chart (submenu 1).
- disable, enable, or position the selected event markers in any of 200 positions across the chart (submenu 2).
- choose the size of the selected waveform from any of the following percentages of full scale: 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{14}$ (submenu 3).

2-3.2.9 USER CHART setup (continued)

- move the center of the waveform channel within a specified range of positions on the chart. The specified range is dependent upon the chosen size of the selected waveform.
- turn the selected grid on or off (submenu 4).
- turn the minor divisions of the selected grid on or off (submenu 4).

Understanding the placement of text buffers and event markers

The total chart width is 216 mm. Position 1 is the left edge of the grid. Position 216 is the right edge of the grid.

Printing requirements permit you to position annotation buffers and event markers within the range of 8 mm on the left edge of the chart and 207 mm on the right edge of the chart. This means that the USER CHART mode provides a total of 200 different chart locations for annotation buffers and event markers.

The "NEXT" and "PREV" soft keys of the TEXT and EVENT submenus of the USER CHART setup are used to select the desired position in 1-millimeter increments.

Position changes are virtually instantaneous and are immediately visible on the printed chart.

2-3.2.9 USER CHART setup (continued)

Understanding the placement of waveform channels

As previously explained, total chart width is 216 mm. Position 1 is the left edge of the grid. Position 216 is the right edge of the grid.

The range of positions on the chart in which a waveform can be positioned depends on the size of the selected waveform. The larger the chosen size of the selected waveform, the more limited the range of movement on the chart.

Waveforms can be any of the following percentages of full scale: $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{14}$.

The "POS" parameter of the WAVES submenu refers to the position of the *center* of the waveform channel.

The DASH 8 does not allow you to position a waveform such that any portion of the waveform is outside of the total chart width and, therefore, unprintable.

The "NEXT" and "PREV" soft keys of the WAVES submenu are used to select the desired position in 1-millimeter increments.

When the size of the selected signal is 1 (full scale), the center of the waveform is positioned at 110 mm. A full scale signal cannot be moved from this position. The signal already occupies the full width of the chart so shifting the signal either to the right or the left would inherently move a portion of the signal off the chart. As explained above, this is not permitted. If minor grid divisions are enabled, the grid will be marked with 100 minor divisions.

2-3.2.9 USER CHART setup (continued)

Understanding the placement of waveform channels (continued)

When the size of the selected signal is $\frac{1}{2}$, the center of the waveform signal can be positioned anywhere on the chart between 58 mm and 161 mm in 1-millimeter increments. If minor grid divisions are enabled, the grid will be marked with 50 minor divisions.

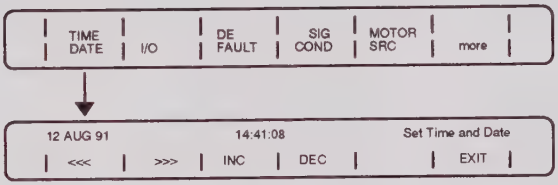
When the size of the selected signal is $\frac{1}{4}$, the center of the waveform signal can be positioned anywhere on the chart between 31 mm and 188 mm in 1-millimeter increments. If minor grid divisions are enabled, the grid will be marked with 50 minor divisions.

When the size of the selected signal is $\frac{1}{6}$, the center of the waveform signal can be positioned anywhere on the chart between 21 mm and 198 mm in 1-millimeter increments. If minor grid divisions are enabled, the grid will be marked with 25 minor divisions.

When the size of the selected signal is $\frac{1}{8}$, the center of the waveform signal can be positioned anywhere on the chart between 17 mm and 202 mm in 1-millimeter increments. If minor grid divisions are enabled, the grid will be marked with 25 minor divisions.

When the size of the selected signal is $\frac{1}{14}$, the center of the waveform signal can be positioned anywhere on the chart between 11 mm and 208 mm in 1-millimeter increments. If minor grid divisions are enabled, the grid will be marked with 10 minor divisions.

2-3.2.10 TIME DATE setup



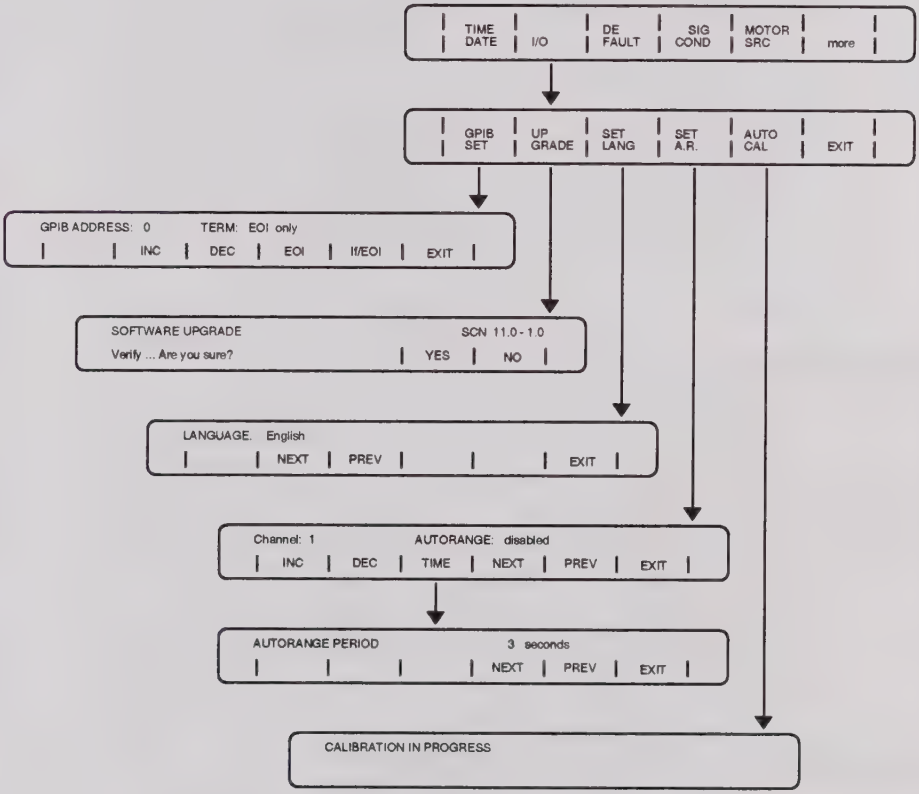
The TIME DATE submenu is used to set the recorder's real-time clock and calendar.

2-3.2.11 I/O setup

The I/O submenu is a multipurpose menu used to accomplish the following tasks:

- set a GPIB address and specify a terminator for all host-control communications.
- call up the menus used to perform an operating-system software upgrade.
- select the desired language for [HELP] key status sheet printouts and certain menu selections. Language selections are English, French, German, and Italian.
- implement the autorange feature and select an autorange range signal monitoring period used to evaluate the input signal's full-scale voltage.
- perform a recorder autocalibration.

2-3.2.11 I/O setup (continued)



Each of these I/O functions is briefly described below. The DASH 8's UPGRADE submenus are discussed later in this manual's Maintenance section.

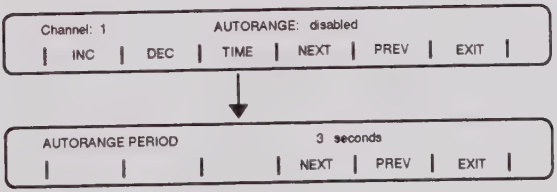
2-3.2.11.1 I/O setup: GPIB SET submenu

The GPIB setup calls up a the menu used to configure the GPIB communications interface. The menu is used to specify a GPIB address and a terminator for all command sequences. Addresses 0 through 30 are available. Terminators are either (1) EOI (end or identify) only or (2) lf (line feed) and EOI.

2-3.2.11.2 I/O setup: SET LANG submenu

The SET LANG submenu is used to select the desired language for [HELP] key status sheet printouts and certain menu selections. The "NEXT" and "PREV" keys scroll through the following language selections: English, French, German, and Italian.

2-3.2.11.3 I/O setup: SET A.R. submenu



2-3.2.11.3 I/O setup: SET A.R. submenu (continued)

The SET A.R. submenu is used to:

- select an individual channel to be configured for autoranging.
- enable or disable the autorange function for that channel.
- and select the length of time that the DASH 8 will examine the input signal to determine its full-scale voltage.

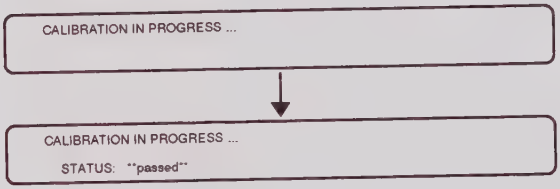
Understanding the autorange function

Simply put, the autorange function of the DASH 8 automatically sets the full-scale voltage value represented on the selected channel's grid to the full-scale voltage value of the selected waveform's amplitude. The only restrictions to the autorange function are that the waveform have a minimum 50 mV excursion and that the input signal be AC. DC signals cannot be autoranged.

To perform autoranging, the DASH 8 must sample the input signal to determine the signal's full-scale voltage value. In other words, the input signal is sampled to obtain the minimum and maximum voltages that represent the full-scale excursion of the chart.

The "TIME" parameter of the SET A.R. submenu allows you to select the time period of the sample. The time period can be from 1 to 99 seconds. To obtain the required data, three iterations of the sample period are needed. For example, a sample period of 1 second will result in three 1-second samples. Thus, the total time required to obtain the required signal information is three times the selected sample period. The DASH 8's sampling range ensures that almost any waveform will be sampled long enough to obtain an accurate picture of its maximum range. This eliminates the chance of out-of-range recording.

2-3.2.11.4 I/O setup: AUTO CAL submenu

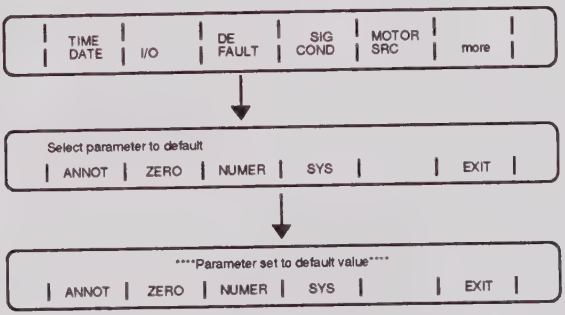


The DASH 8 can calibrate itself on demand with a precision traceable to the requirements of the United States Institute of Standards and Technology (NIST).

Pressing the soft key beneath "AUTO CAL" immediately starts an automatic self-calibration process. When "AUTO CAL" is pressed,

- each channel input is grounded.
- an extremely precise reference voltage is input.
- internal adjustments are automatically made as necessary to exactly maintain the original zero and position selections.

2-3.2.12 DEFAULT setup



2-3.2.12 DEFAULT setup (continued)

The DEFAULT setup allows you to:

- individually reset the ANNOTATION, ZERO position, NUMERICAL, or CHANNEL ORDER setups to their default values.
- reset all system setups to their default values.

Setting any parameter in any channel to its default value sets that parameter in all channels to the default value.

analog setting defaults

range	10.0 V
zero suppression	0.0 V
mode	pk—pk
ground / signal	signal
filter	off
reporting	off
pen lift	down
autoranging	on
numerical	L = 200E + 0
	R = -200E + 0
trigger level (high)	75%
trigger level (low)	25%

2-3.2.12 DEFAULT setup (continued)

real-time recording system settings defaults

grid printing	on
printing of minor divisions	on
printing of System Log	on
recording speed	25 mm/s
insta speed key [A]	10 mm/s
insta speed key [B]	35 mm/s
insta speed key [C]	75 mm/s
printing of system event marker	on
timer event	0.1 second
motor clock source	internal timer
Datalogger recording speed	175 ms/l
Dual Speed recording settings:	
grid	8 channel
speed 1	25 mm/s
speed 1 duration	00:00:05
speed 2	50 mm/s
speed 2 duration	00:00:05
TIMER mode settings:	
start date	01/01/91
start time	00:00:00
stop date	01/01/91
stop time	00:00:00
Options installed	*
system software configuration	*

* will be listed as appropriate to your individual recorder

2-3.2.12 DEFAULT setup (continued)

data capture / playback defaults

sample rate	250 kHz
trigger/window relationship	50%
acquisition rearm	manual
storage method	normal
playback format	8 grid
magnification factor	1
playback percentage	0% - 100%
X - Y channels	1 - 2

trigger setting defaults

trigger source	manual
WAVE OR	A
AND: (A)	channel 1
AND: (B)	channel 2
AND: (C)	channel 3
AND: (D)	channel 4
AND: (E)	channel 5
AND: (F)	channel 6
AND: (G)	channel 7
AND: (H)	channel 8

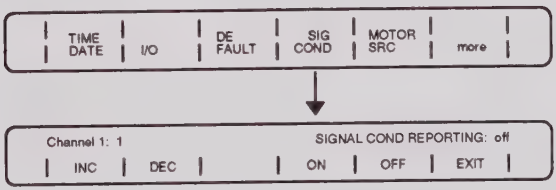
2-3.2.12 DEFAULT setup (continued)

user chart defaults

	ch 1	ch 2	ch 3	ch 4
signal size	x 1/4	x 1/4	x 1/14	x 1/14
signal position	184 mm	135 mm	102 mm	85 mm
grid printing	on	on	on	on
minor divisions	on	on	on	on
text position	159 mm	110 mm	93 mm	76 mm

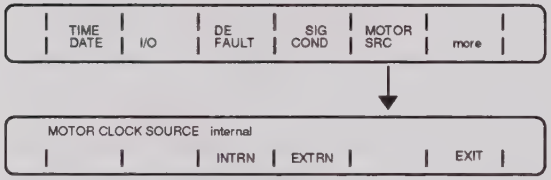
	ch 5	ch 6	ch 7	ch 8
signal size	x 1/14	x 1/14	x 1/14	x 1/14
signal position	68 mm	51 mm	34 mm	17 mm
grid printing	on	on	on	on
minor divisions	on	on	on	on
text position	59 mm	42 mm	25 mm	8 mm

2-3.2.13 SIG COND setup



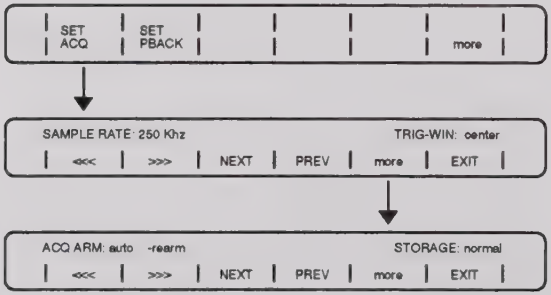
The SIG COND setup is used to enable or disable the printing of signal conditioner reporting in the selected interchannel annotation buffer.

2-3.2.14 MOTOR SRC setup



The MOTOR SRC setup is used to specify whether the speed of the stepper motor clock will be referenced to the DASH 8's internal clock or to an external speed source.

2-3.2.15 SET ACQ setup



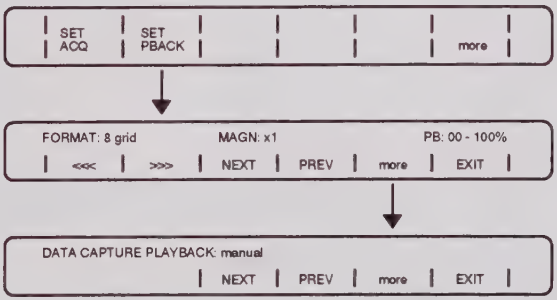
The SET ACQ setup uses two submenus to define the following data capture parameters:

- the frequency with which data will be sampled (100 Hz, 500 Hz / 1, 5, 10, 50, 100, 250 kHz)
- data capture pre- and post-trigger percentages (start, 10%, 20%, 30%, 40%, center, 60%, 70%, 80%, 90%, end)

2-3.2.15 SET ACQ setup (continued)

- allocation of data-capture sample memory:
  - **normal**: each of the eight channels allocated 32k of data capture memory
  - **segmented**: each channel allocated eight stacked data capture records. Each record is allocated 4k of memory.
- selection of manual or automatic trigger rearming

2-3.2.16 SET PBACK setup



The SET PBACK setup calls up two submenus that define the format in which captured data will be played back, a magnification factor or compression factor for the playback, and the percentage of the playback to be printed. Whether playback will be manual or automatic is also specified in the SET PBACK setup.

The "FORMAT" field can be set to any of five format options: 1 grid, 2 grid, 4 grid, 6 grid, 8 grid, user grid, numeric (Datalogger), XY plot.

2-3.2.16 SET PBACK setup (continued)

When XY plot is the selected format, the menu presents fields that allow you to select the channel you want to be plotted as the X axis and the channel you want to be plotted as the Y axis.

The "MAGN" field can be set to any of six playback magnification factors: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4.

The "PB" field increases or decreases in 10% increments the percentage of captured data that is played back.

The DATA CAPTURE PLAYBACK submenu is used to select whether playback of captured data will take place automatically or will be selected manually.

2-3.3 Storing and recalling system setups

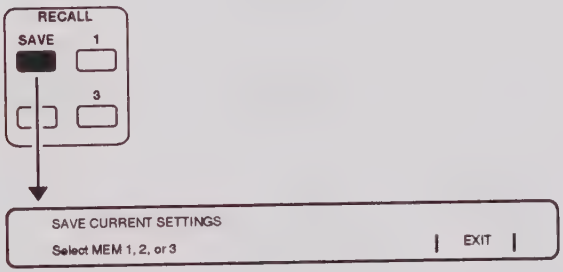
The keys of the RECALL group store and recall three complete system setups. Consequently, the RECALL group is very helpful if your recording requirements demand regular use of a number of different system setups. Use the procedures below to store and recall any of three complete setups. Remember that you can use the recorder's [HELP] key to get a printout that lists all the parameter settings for all three of the stored system setups. See paragraph 2-2.2 of this manual for more information on using the [HELP] key for this purpose.

2-3.3.1 Storing a complete system setup (continued)

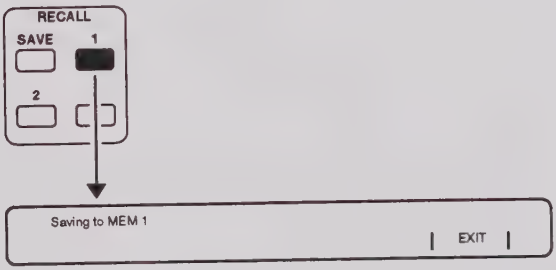
1 Use the [SYSTEM] key menus to specify each system setup parameter.

2 Press the [SAVE] key of the RECALL group.

The submenu that is called up indicates that all of the setups defining the current system will be saved into the RECALL group's [1], [2], or [3] key when that key is pressed.



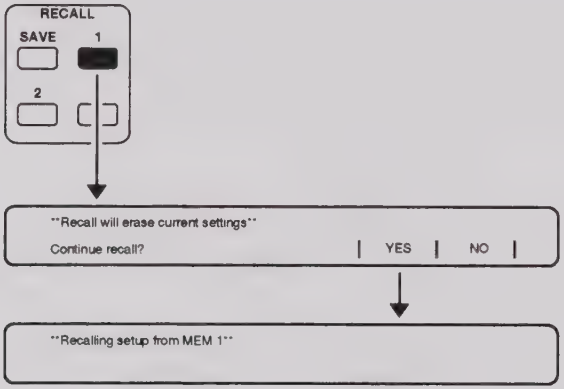
3 Press the RECALL numeric key–[1], [2], or [3]–into which you want to store the system you just defined. The system setup is immediately stored for later recall.



2-3.3.2 Recalling a system setup

Press the RECALL group numeric key that contains the system setup that you want to call up: either [1], [2], or [3].

The message that results indicates that all current setups will be replaced with those of the recalled setup when the numeric key is pressed.



2-4

Recording data in real time

The basic DASH 8 is a real-time recorder. The data capture option (DC-85) is required to perform data capture and playback. A discussion of data capture and playback modes follows this real-time mode information.

All DASH 8 modes of operation are entered by pressing the [MODE] key of the MENU group.

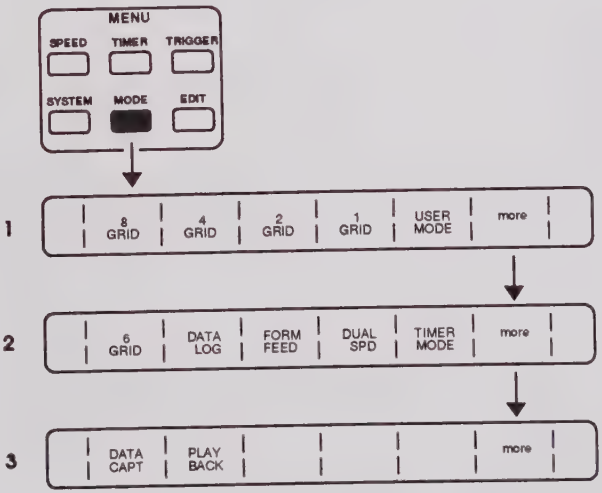
2-4

Recording data in real time (continued)

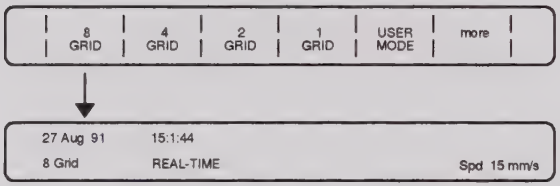
The real-time recording modes of the DASH 8 are:

- 8 GRID recording
- 4 GRID recording
- 2 GRID recording
- 1 GRID recording
- USER MODE recording
- 6 GRID recording
- DATA LOG recording
- FORMFEED mode
- DUAL SPD recording
- TIMER MODE recording

Pressing the [MODE] key of the DASH 8 results in the three-level sequential menu flow shown below.

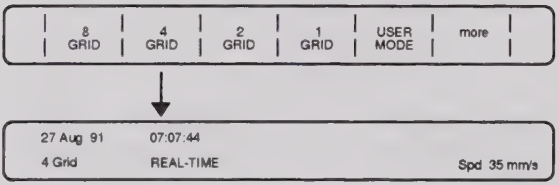


2-4.1 Recording in the 8 GRID mode



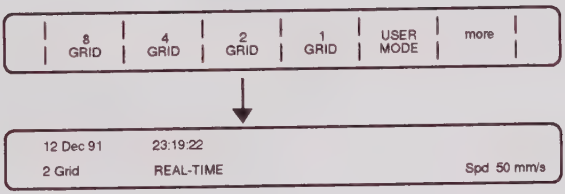
Pressing the soft key beneath "8 GRID" immediately enters the recorder into the 8-channel real-time recording mode and calls up the 8 Grid REAL-TIME display. The eight-channel format consists of eight separate 21.88mm-wide grids each containing an individual waveform.

2-4.2 Recording in the 4 GRID mode



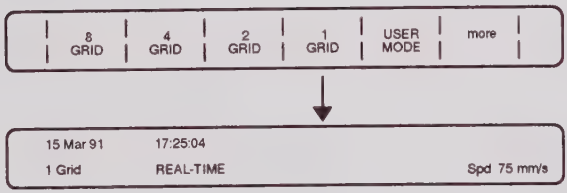
Pressing the soft key beneath "4 Grid" immediately enters the recorder into the 4-channel real-time recording mode and calls up the 4 Grid REAL-TIME display. The four-channel format consists of four 43.75mm-wide grids each containing two overlapped waveforms.

2-4.3 Recording in the 2 GRID mode



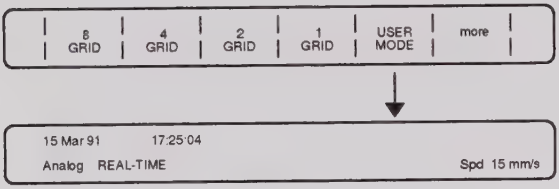
Pressing the soft key beneath "2 GRID" immediately enters the recorder into the 2-channel real-time recording mode and calls up the 2 Grid REAL-TIME display. The two-channel format consists of two separate 87.5mm-wide grids each containing an individual waveform.

2-4.4 Recording in the 1 GRID mode



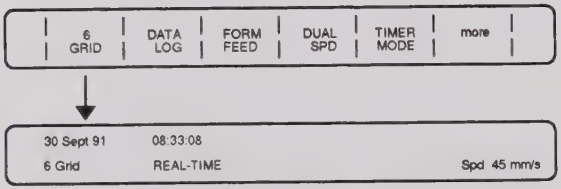
Pressing the soft key beneath "1 GRID" immediately enters the recorder into 1-channel real-time recording and calls up the 1 Grid REAL-TIME display. The one channel format consists of one 175 mm-wide grid.

2-4.5 Recording in the USER MODE



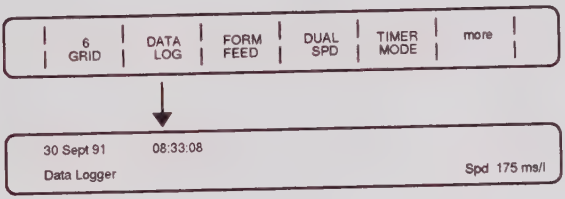
Pressing the soft key beneath "USER MODE" immediately enters the recorder into analog real-time recording in the format defined by the USER CHART setup. The USER CHART setup is described on pages 2-24 through 2-27 of this manual.

2-4.6 Recording in the 6 GRID mode



Pressing the soft key beneath "6 GRID" immediately enters the recorder into 6-channel real-time recording and calls up the 6 Grid REAL-TIME display. The six channel format consists of six 28.13mm-wide grids.

2-4.7 Recording in the DATA LOG mode



Pressing the soft key beneath "DATA LOG" immediately enters the recorder into Datalogger format real-time recording and calls up the DataLogger display. The Datalogger format consists of columns of tabular numeric data. This mode is defined using the NUMERICAL setup discussed on page 2-22 of this manual.

2-4.8 Using the FORM FEED mode

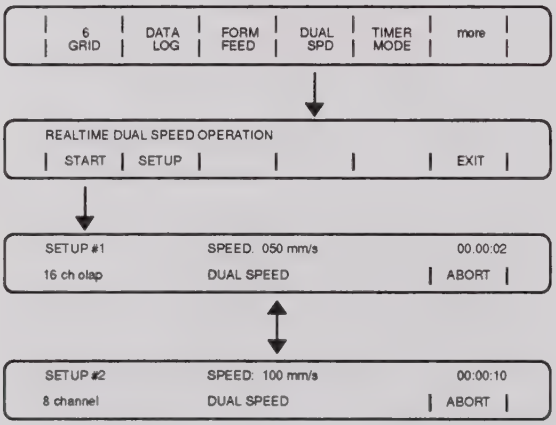
Pressing the soft key beneath "FORM FEED" immediately advances the chart paper to the next top-of-form index mark.

2-4.9 Recording in the DUAL SPD mode

The Dual Speed recording mode provides two methods to toggle automatically between two preset chart speeds: timed dual-speed recording and triggered dual-speed recording.

No triggers are involved in placing the recorder into timed dual-speed operation. However, as the term implies, triggers activate triggered dual-speed recording.

You can begin dual-speed operation simply by entering the Dual Speed mode and pressing the soft key beneath "START" in the resulting submenu. Dual speed recording will begin immediately and will be in either the last format used or the default format.



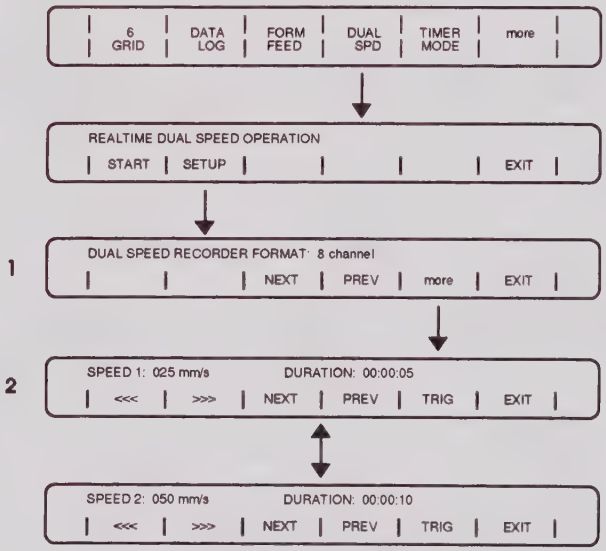
To customize the dual-speed setups, you must use the "SETUP" submenus as described in the paragraphs that follow.

2-4.9.1 Setting up timed dual-speed recording

Timed dual-speed recording causes the recorder to toggle continuously between two preset chart speeds that you define. The recorder will operate at each speed for the period of time that you define.

Therefore, in timed dual-speed operation you must:

- set the speeds you want the recorder to toggle between.
- set the length of time you want the recorder to remain at each speed before toggling to the other speed.



2-4.9.1 Setting up timed dual-speed recording (continued)

In submenu 1, use "NEXT" and "PREV" to select the recording format you want.

In submenu 2, use "NEXT" and "PREV" to select and set speed 1 and to select and set a time duration which the recorder will "countdown" before toggling to speed 2.

Also use submenu 2 to select and set speed 2 and a time duration which the recorder will "countdown" before toggling to speed 1.

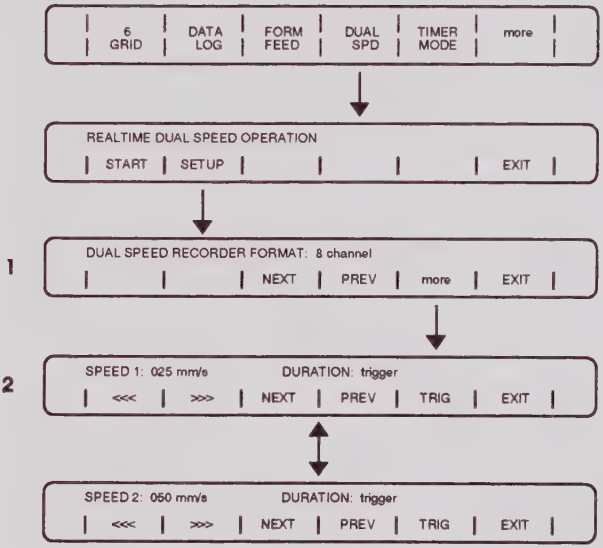
2-4.9.2 Setting up triggered dual-speed recording

Triggered dual-speed recording causes the recorder to toggle between two preset speeds as triggers are detected.

In triggered dual-speed recording, you must:

- set an initial chart speed (speed 1).
- set the DURATION field of speed 1 to "trigger." When a trigger is detected, the recorder toggles to speed 2.
- set the alternate chart speed (speed 2) to which the recorder will toggle when a trigger is detected during operation at speed 1.
- set the DURATION field of speed 2 to "trigger." When a trigger is detected, the recorder toggles to speed 1.

2-4.9.2 Setting up triggered dual-speed recording (continued)



In submenu 1, use "NEXT" and "PREV" to select the recording format you want.

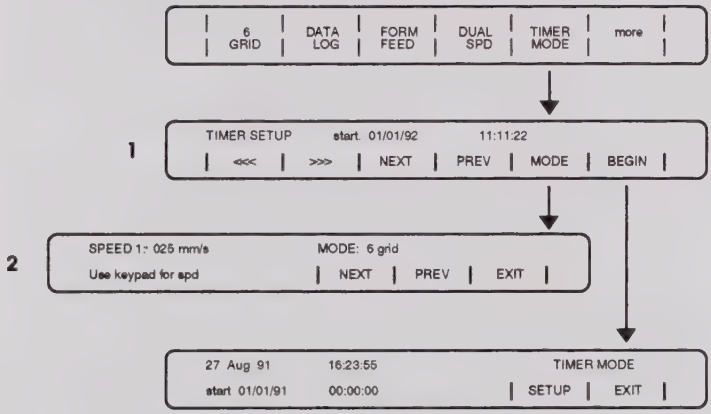
In submenu 2, use "NEXT" and "PREV" to select and set speed 1 and to set the DURATION field to "trigger." "Trigger" means that recording will continue at speed 1 until a trigger is detected and the recorder toggles to speed 2.

Also use submenu 2 to select and set speed 2 and to set the DURATION field to "trigger." "Trigger" means that recording will continue at speed 2 until a trigger is detected and the recorder toggles back to speed 1.

2-4.10 Recording in the TIMER MODE

The TIMER MODE is used to program the DASH 8 to:

- start recording at a preset time.
- record at a preset speed.
- record in a preset format.
- stop recording at a preset time



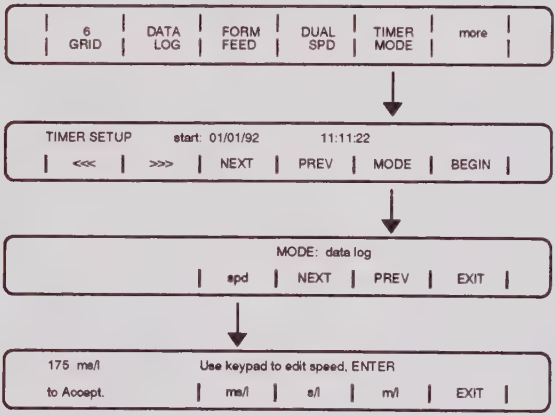
In submenu 1, use "NEXT" and "PREV" to select a start time and date and a stop time and date. Use the soft keys beneath "<<<" and ">>>" to select each digit in each field. As each digit is selected, it blinks indicating that it can be changed.

Pressing the soft key beneath "BEGIN" in submenu 1 causes the recorder to enter operation in the TIMER MODE.

Submenu 2 is used to select a recording format. Chart paper speed is also set using this submenu.

2-4.10.1 Recording in the Datalogger format in the TIMER MODE

In the Datalogger mode, the sample period determines how frequently waveform data is printed. For example, a sample period of 175 ms means that a line of data is printed every 175 milliseconds (175 ms/line). This is different from all other modes which print in terms of millimeters per unit of time. As a result, setting up for timed operation in the Datalogger mode is slightly different from that required by the other recording formats.



2-5

Capturing data

Data is captured using the DATA CAPT mode. The DATA CAPT mode has only a single function: to effect an immediate data capture when specified triggering conditions are met. To perform any data capture functions, the recorder must be equipped with the Data Capture option (DC-85).

2-5.1 About data-capture triggers

Data captures result from a trigger. A trigger is nothing more than a signal level that, when met or exceeded in the specified portion of the input signal, causes the recorder to do any of the following:

- acquire waveform data and store it for replay.
- acquire waveform data and immediately replay the data in a predefined format of your choice.
- toggle between two preset speeds when in the preforming triggered dual-speed recording.

The SET ACQ (page 2-37) and SET PBACK (page 2-38) system setups are used to specify certain parameters that help define a data capture profile.

The front-panel [TRIGGER] key of the MENU group also must be used to define the desired trigger conditions. Because triggering is a fundamental prerequisite to capturing data, the use of the [TRIGGER] key of the MENU group is discussed below before the DATA CAPT mode is presented.

NOTE

Two of the DASH 8's front-panel keys are labeled "TRIGGER." Throughout this discussion the expression "[TRIGGER] key" refers to the [TRIGGER] key of the MENU group.

The other trigger key is the manual [TRIGGER] key located beneath the [EVENT] key in the Operation group. The only use for this key is to initiate manual triggers. Do not confuse the functions of the two keys.

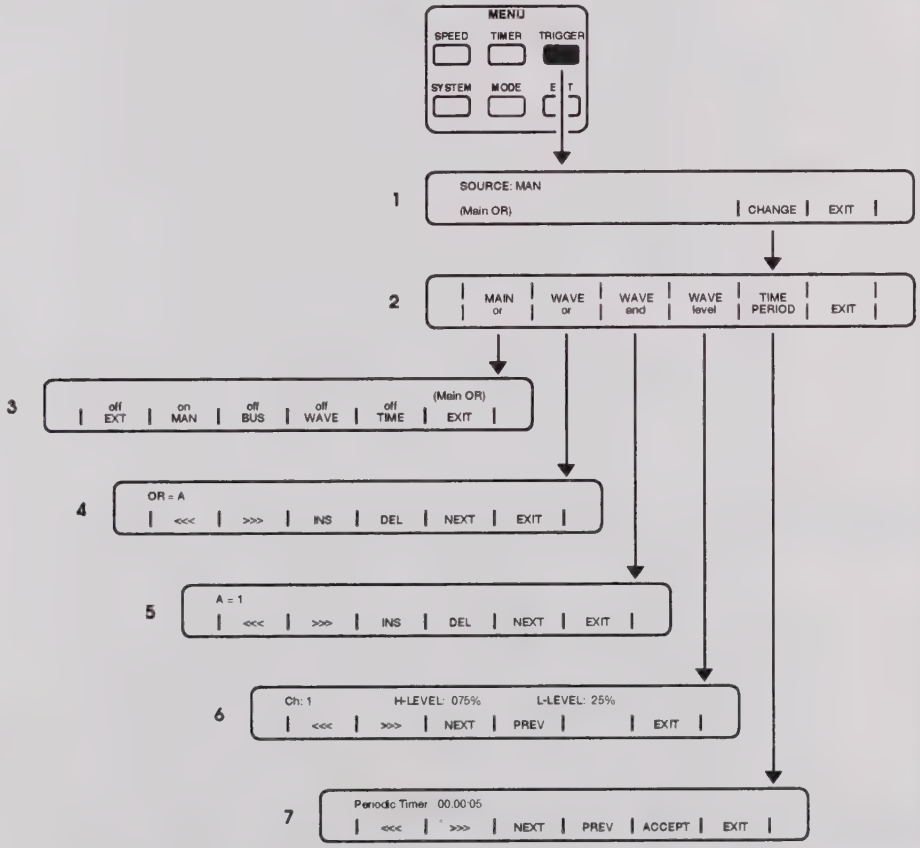
2-5.1.1 Functions of the [TRIGGER] key

The [TRIGGER] key of the MENU group is used to:

- enable or disable the five major categories of trigger sources:
  - externally generated triggers communicated through the recorder's rear-panel UTILITY D-shell.
  - manually generated triggers initiated by the front-panel manual [TRIGGER] key.
  - host-computer generated triggers communicated through the rear-panel GPIB D-shell.
  - waveform-generated triggers occurring when the waveform signal exceeds or falls below a user-defined trigger range.
  - trigger's generated automatically and continuously at specified time intervals by the recorder's periodic timer.
- enable or disable as trigger sources and create OR trigger relationships between:
  - individual waveforms
  - waveforms combined in AND groups
  - mixed groups of individual waveforms and waveforms combined in AND groups
- define a range within the full-scale value of the channel that will constitute a true trigger window.
- enable or disable triggers that will be automatically and continuously generated at specific time intervals.

2-5.1.1 Functions of the [TRIGGER] key (continued)

Each of these trigger functions is individually discussed in the paragraphs that follow.



2-5.1.2 What are the DASH 8 trigger sources? (continued)

Any of the following may constitute a DASH 8 trigger source:

EXT a switch closure or low logic level on the external trigger.

MAN pressing the front-panel manual [TRIGGER] key.

BUS a pulse on the host-control GPIB trigger line.

WAVE a change in any analog input signal (waveform) that exceeds or falls below the user-specified range of the trigger window.

TIME PERIOD trigger impulse continuously generated at specific time intervals as defined in the periodic trigger timing menu.

2-5.1.3 Enabling or disabling trigger sources

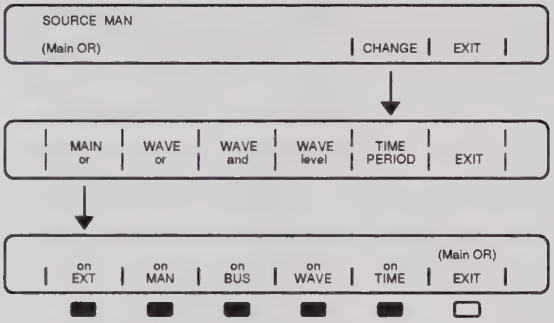
A trigger source must be enabled in order for the DASH 8 to recognize any triggers that the source may generate. This means that enabling the trigger source is fundamental to data capture.

Use the procedure below to enable or disable any or all of the five major categories of trigger sources.

1. Press the [TRIGGER] key and go to the "MAIN OR" submenu.

2. Press the soft key beneath the potential trigger source or sources that you want to enable until the word "on" appears above the name of the source. The source is then enabled.

2-5.1.3 Enabling or disabling trigger source (continued)

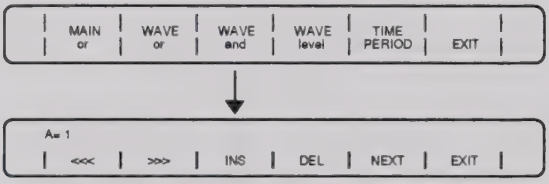


When the word "off" appears above the trigger source name, the trigger source is disabled.

2-5.1.4 Understanding how waveform trigger sources are selected and combined

The DASH 8 allows you to define virtually any triggering combination between waveform input signals that you desire. This is an extremely powerful and flexible data-capture tool.

In the DASH 8, all waveform trigger sources whether individual or combined are defined in the "WAVE and" submenu. Note that, as shown below, a simple equation always appears in the top line of the menu.



2-5.1.4 Understanding how waveform trigger sources are selected and combined (continued)

All waveform trigger sources are defined by this simple equation which in generic form can be expressed as: trigger = waveform channel number.

In this equation, letters A through H are used to represent the waveform trigger sources. The letter can stand for a single waveform trigger source or a combination of waveform trigger sources in an AND group. This allows you to define eight individual waveform triggers or eight groups of combined waveform triggers each of which will be alphabetically represented as A, B, C, D, E, F, G, or H.

Because the DASH 8 is an eight-channel recorder, the waveform channel number on the right side of the equation will be 1 through 8 or any combination of channel numbers 1 through 8.

Thus, when you define a waveform trigger source, you always end up with a letter—A through H— that always stands for:

- a single triggering waveform channel number, or
- a combination of triggering waveform channel numbers in an AND group.

For example:

In this example, we have arbitrarily defined our term A (the trigger) as consisting of two channels (channels 1 and 2) in an AND group. When the input signal levels **in both channels** exceed or fall below our trigger window, a valid trigger will be generated.

2-5.1.4 Understanding how waveform trigger sources are selected and combined (continued)

When you have defined one waveform trigger source, you can select another letter and define another waveform trigger. Again, this trigger source can be a single waveform channel or a combination of waveforms channels. You can do this until waveform triggers have been defined for each letter.

You need to use the soft keys beneath the menu to define your terms.

Use the "<<<" or ">>>" soft keys to select either the letter or the waveform channel numbers. When selected, the letter or number will blink.

Use the "NEXT" soft key to change the selected letter to next alphabetical letter or the selected number to the next higher waveform channel number.

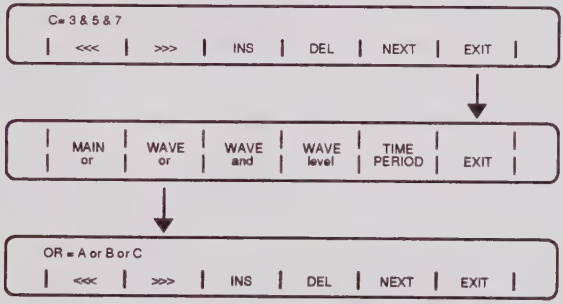
Use the "DEL" soft key to delete key to delete the blinking waveform channel number selection.

Use the "INS" soft key to insert waveform channel numbers and add them to your selections. When the "INS" key is used it adds a channel number that is identical to the last inserted channel number.

2-5.1.4 Understanding how waveform trigger sources are selected and combined (continued)

Use the "<<<" or ">>>" soft keys to select the newly added channel number and use the "NEXT" soft key to change the added number to the channel number you want to use.

When you have defined all of the waveform trigger sources that you desire, you must leave the "WAVE and" and go to the "WAVE or" menu.



You will note that the top line of the "WAVE or" menu is an OR group that displays any of the letters A through H to indicate the currently selected waveform trigger sources. You already know that these letters stand for either a single triggering waveform channel number or a combination of waveform channel numbers.

You must now use the "WAVE or" menu's soft keys to ensure that the waveform triggers that you just defined appear in the top line of the menu. Following our example, waveform triggers have been defined for letters A, B, and C.

Use the "<<<" or ">>>" soft keys to select each currently displayed waveform trigger letter. When selected, the letter will blink.

2-5.1.4 Understanding how waveform trigger sources are selected and combined (continued)

Use the "NEXT" key to change the selected letter to the letter representing any of the waveform trigger choices you just defined.

Use the "DEL" soft key to delete any of the current selections that you do no longer want as active waveform trigger sources.

Use the "INS" soft key to insert additional letters that you want to add to your selections. When the "INS" key is used it adds a letter that is identical to the last inserted letter.

Use the "<<<" or ">>>" soft keys to select the newly added letter and use the "NEXT" soft key to change the added letter to a letter that you have already defined and want to use as a trigger source.

When all the letters that you have defined as waveform trigger sources and want to use during your current recording appear in the top line of the "WAVE or" menu, your waveform trigger selections are current and active.

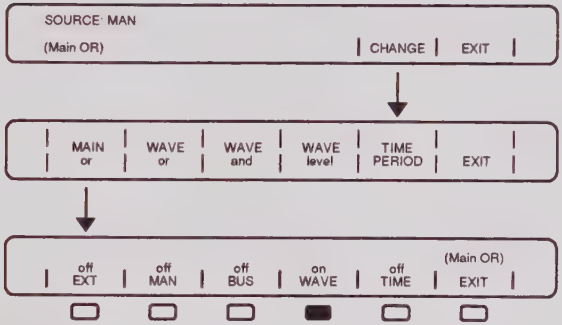
2-5.1.5 Enabling or disabling waveform trigger sources

1. Press the [TRIGGER] key and go to the "MAIN OR" submenu.

2. Press the soft key beneath "WAVE" until the word "on" appears above "WAVE." This enables all waveform input signals as potential trigger sources.

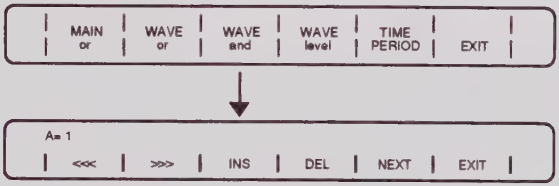
2-5.1.5 Enabling or disabling waveform trigger sources

(continued)



3 Press the soft key beneath "EXIT" and return to "MAIN or" menu.

4 Press the soft key beneath "WAVE and." A submenu similar to the following results:



5 Use the "<<<" or ">>>" soft keys to select the letter parameter (the trigger term) appearing in the menu.

6 Use the "NEXT" key to change the letter (trigger term) to the letter that you want to represent the waveform trigger you are specifying. The trigger term can be defined as any letter from A through H.

2-5.1.5 Enabling or disabling waveform trigger sources

(continued)

7 Use the "<<<" or ">>>" soft keys to select the waveform channel number parameter appearing in the menu. As required, use these keys to select each number.

8 At this point, use the soft keys beneath the "WAVE and" menu in the following ways.

Use the "NEXT" key to change the selected waveform channel number to a waveform channel number that you want to use as a trigger source.

Use the "DEL" key to delete any selected waveform channel number that you no longer want as a trigger source.

Use the "INS" soft key to insert waveform channel numbers and add them to your selections. As previously explained, the "INS" key adds a channel number that is identical to the last inserted channel number. Use the "<<<" or ">>>" soft keys to select the newly added channel number and use the "NEXT" soft key to change the added number to the channel number you want to use.

NOTE

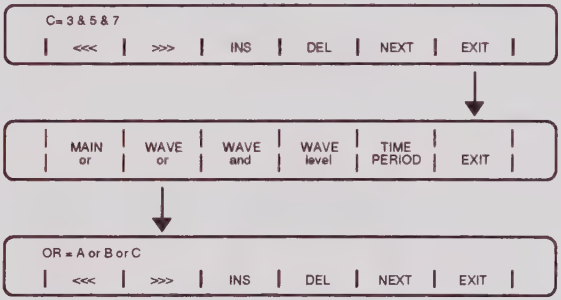
If your waveform trigger selections result in an individual waveform channel number opposite the alphabetic letter, then you have defined the letter as a single-channel trigger source.

Two or more waveform channel numbers opposite the alphabetic letter defines the letter as a trigger source consisting of multiple waveform channels in an AND group.

2-5.1.5 Enabling or disabling waveform trigger sources

(continued)

9 Exit the "WAVE and" menu and go to the "WAVE or" submenu.



10 Use the "WAVE or" menu's soft keys to ensure that the waveform triggers that you just defined appear in the top line of the menu.

Use the "<<<" or ">>>" soft keys to select each currently displayed letter parameter (trigger term). When selected, the letter will blink.

Use the "NEXT" key to change the selected letter (trigger term) to the letter representing any of the waveform trigger choices you just defined.

Use the "DEL" soft key to delete any of the current selections that you do no longer want as active waveform trigger sources.

Use the "INS" soft key to insert additional letters that you want to add to your selections. The "INS" key adds a letter that is identical to the last inserted letter.

Use the "<<<" or ">>>" soft keys to select the newly added letter and use the "NEXT" soft key to change the added letter to a letter that you have already defined and want to use as a trigger source.

2-5.1.5 Enabling or disabling waveform trigger sources

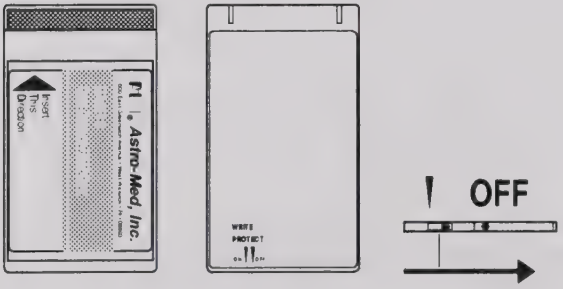
(continued)

When all the letters that you have defined as waveform trigger sources and want to use during your current recording appear in the top line of the "WANE or" menu, the waveform trigger selections are current and active.

2-5.2 Preparing to capture data: Using the Data Capture RAM card

Before data capture can occur, an Astro-Med Data Capture RAM card must be inserted in the recorder's rear-panel RAM card slot. This simple procedure is described below.

1 Ensure that the RAM card's write-protect tab is set to the OFF position. Data will not write to the card if write protection is ON.



2 Locate the recorder's rear-panel RAM card slot and insert the Astro-Med Data Capture RAM card front-side up into the slot.

2-5.3 Using the DATA CAPT mode

Use the SET ACQ (page 2-37) and SET PBACK (page 2-38) setups to define the arming status and playback status that you desire. Use the [MODE] key to access the DATA CAPT mode.

Data capture trigger arming and playback options are:

- manual trigger arming with manual playback.
- manual trigger arming with automatic playback.

- automatic trigger arming with manual playback.
- automatic trigger arming with automatic playback.

The menu flows for each of these potential combinations are given on the pages that follow.

The **manual trigger arming / manual playback** setup demands operator action in submenus 1 and 2. The setup provides an optional choice for pausing and resuming the playback in submenus 3 and 4.

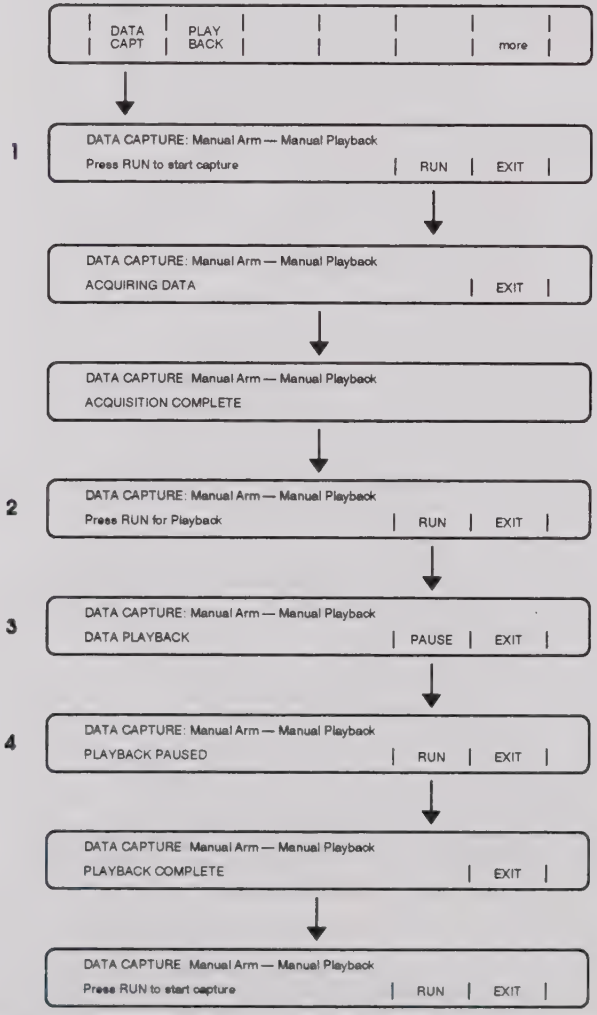
The **manual trigger arming / auto playback** setup demands operator action only in submenu 1. The setup provides an optional choice for pausing and resuming the playback in submenus 2 and 3.

The **auto trigger arming / manual playback** setup demands operator action only in submenu 1. The setup provides an optional choice for pausing and resuming the playback in submenus 2 and 3.

The **auto trigger arming / auto playback** setup is completely automatic and does not require any operator action. The setup provides an optional choice for pausing and resuming the playback in submenus 1 and 2.

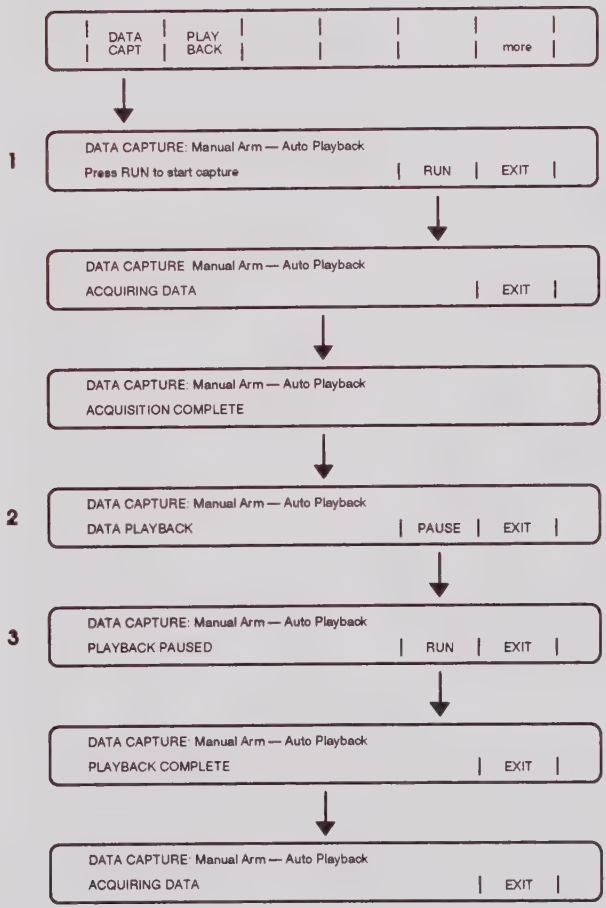
2-5.3 Using the DATA CAPT mode (continued)

manual arming / manual playback



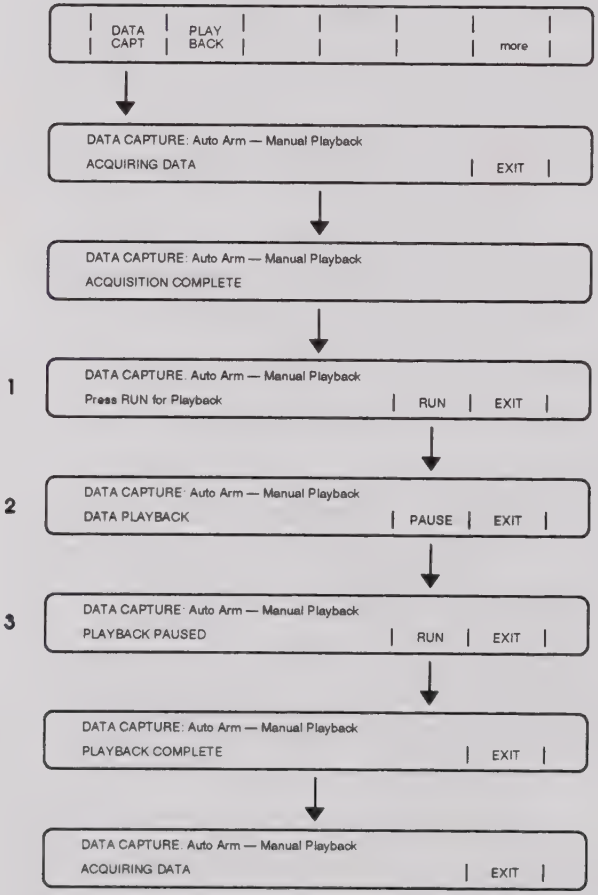
2-5.3 Using the DATA CAPT mode (continued)

manual arming / auto playback



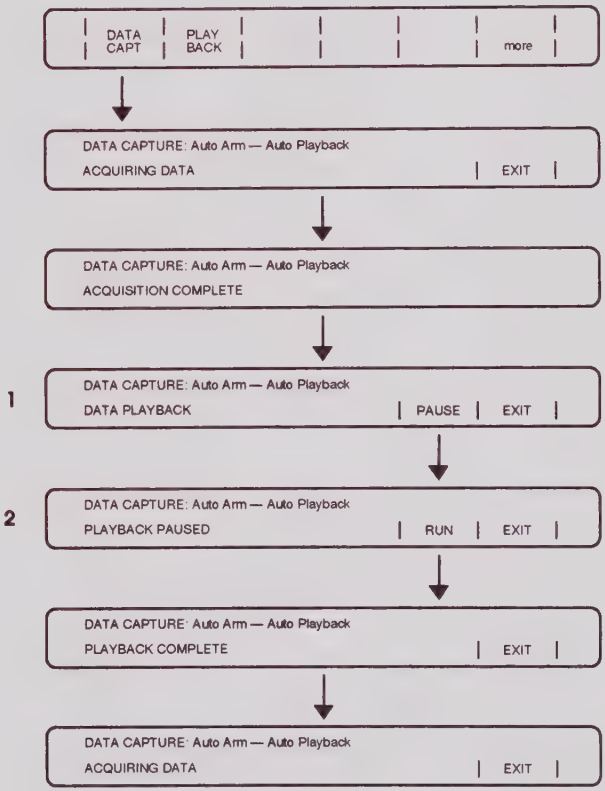
2-5.3 Using the DATA CAPT mode (continued)

auto arming / manual playback



2-5.3 Using the DATA CAPT mode (continued)

auto arming / auto playback



2-5.4 The [ARM] key and background data capture

The front-panel [ARM] key manually activates the DASH 8's background data capture capability. This powerful capability allows data acquisition to occur "in the background" without interrupting on-going real-time recording.

When a background data capture occurs and the DATA CAPTURE PLAYBACK parameter of the SET PBACK setup is set to "auto," the captured data will be played back immediately and automatically.

When a background data capture occurs and the DATA CAPTURE PLAYBACK parameter of the SET PBACK setup is set to "manual," the following display results.

```
DATA CAPTURE COMPLETE
```

This message will remain until the captured data is played back. This ensures that ongoing real-time recording will not be unintentionally interrupted with consequent loss of current real-time data. It also ensures that the captured data will be played out before being replaced by any subsequent data captures.

If a data capture occurs when the recorder is not operating in a real-time recording mode, the display will briefly show the DATA CAPTURE COMPLETE message and will then return to its previous display.

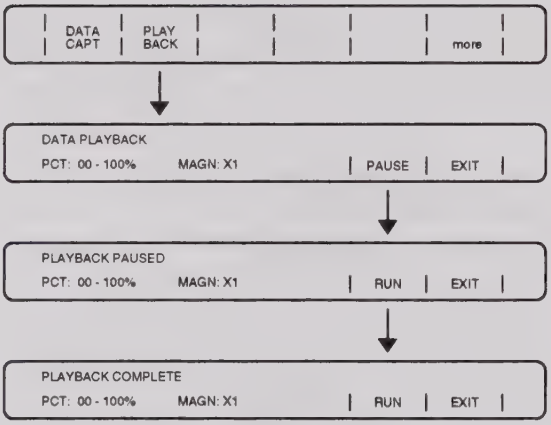
2-5.4 The [ARM] key and background data capture

(continued)

It is important to be aware of the following characteristics of background data capture.

- Background data capture must be armed in order for it to be used during real-time recording.
- If the ACQ ARM menu of the SET ACQ setup is set to automatic rearm ("auto — rearm"), then background data capture is already armed and the ARM LED is illuminated when any real-time recording mode is entered.
- If the ACQ ARM menu of the SET ACQ setup is set to manual rearm ("manual — rearm"), then background data capture is not armed when real-time recording is entered. In this case, you need to arm background data capture by pressing the [ARM] key.
- When background data capture is active, data immediately and constantly flows through the circular data-capture memory buffer. Therefore, activating background data capture immediately flushes any data already in the buffer. The flushed data is not recoverable.

2-5.5 Using the PLAYBACK mode



The PLAYBACK mode has only a single function: to effect an immediate playout of captured data. The format and characteristics of the playback are completely defined using the SET PBACK setup described on page 2-38 of this manual. To playback captured data, the recorder must be equipped with the Data Capture option (DC-85).

Pressing the soft key beneath "PLAYBACK" immediately starts playback of captured data. Each menu of the playback sequence displays the percentage of the acquisition that is being played out and the magnification factor applied to the data.

As the data is played out, a menu offers you the option to pause the playout.

2-6

Making the chart look like you want it to look

When you have begun recording there are many ways to control the chart so that the presentation of the data on the chart is responsive to your specific requirements. The recorder's many chart controls include:

- editing annotation in the interchannel buffers
- using the on-demand annotation buffer
- shifting the waveforms within their channels
- changing the order in which the channels are printed
- grounding waveforms
- labeling each waveform with a channel identification number
- continuous printing of channel ID numbers
- using event markers to mark data of interest
- printing trilevel timing marks on the grid

Each of these topics is explained below.

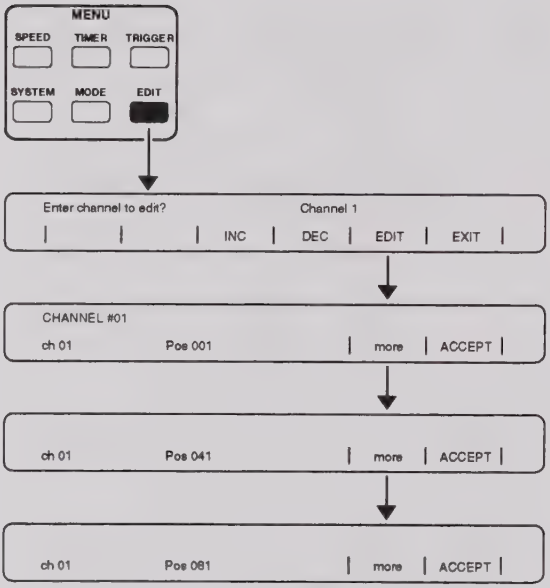
2-6.1 Editing annotation in the interchannel buffers

The [EDIT] key is used to select an interchannel buffer and edit the contents of the buffer. Each interchannel buffer is 120-characters long. In addition to the individual channel buffers, the System Log can be selected for editing.

Pressing the soft key beneath "EDIT" causes the menu listing the first forty characters of the interchannel buffer to be displayed. The current contents of the buffer are listed across the top level of the display. The first character of the display is automatically selected and flashing. This indicates that it can be changed. The bottom level of the display indicates the channel number of the displayed interchannel buffer.

2-6.1 Editing annotation in the interchannel buffers

(continued)

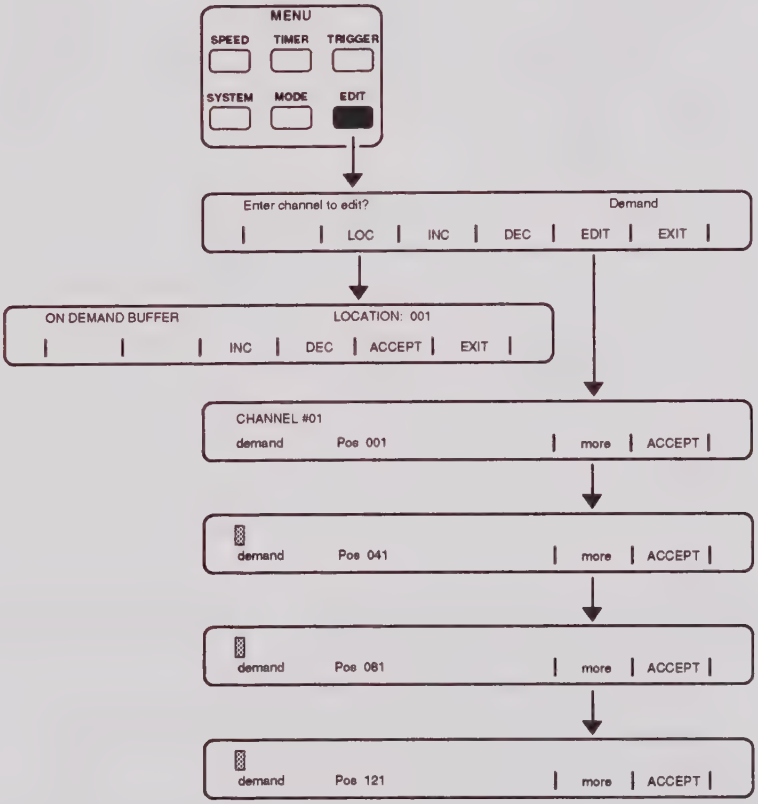


The "Pos" (position) parameter indicates the number of the interchannel buffer space (001 - 80) currently selected.

Use the alphanumeric keypad to enter the characters of your choice in the buffer.

- The right and left arrow keys move through each space of the displayed buffer content selecting each character for change.
- The [DEL] key deletes any currently displayed character. If the [DEL] key is pressed and held, any currently selected character and all characters to its right will be deleted.
- The [INS] key allows you to select any position from within the buffer and insert data from that point.

2-6.2 Using the on-demand annotation buffer



The on-demand annotation feature provides a 128-character annotation buffer that can be printed in any of 200 locations across the width of the chart. Row 1 corresponds to the system channel on the left edge of the grid as viewed from the recorder's front. Rows 1 through 200 move progressively to the right across the chart.

2-6.2 Using the on-demand annotation buffer

(continued)

The front-panel [EDIT] key is used to access the menus that specify what will be printed in the on-demand buffer and placement of the buffer on the chart.

1 Press the front-panel [EDIT] key. In the resulting menu, press the soft keys beneath either "INC" or "DEC" until "Demand" appears opposite "Enter channel to edit?".

2 Press the soft key beneath "LOC." Press the soft key beneath either "INC" or "DEC" to select the number of the row in which you want the on-demand buffer printed.

When the row number that you want appears in the menu, press the soft key beneath "ACCEPT." The display will return to the initial "EDIT" menu.

3 Press the soft key beneath "EDIT" in the initial menu. The top line of the resulting menu shows the current content of the first 41 character spaces of the on-demand buffer. The first character of the buffer blinks indicating that it is selected and can be edited.

The bottom line of the menu tells you that you have accessed the "demand" buffer and shows the current location within the buffer.

4 When you have accessed the on-demand buffer, use the arrow keys of the recorder's alphanumeric keypad to scroll through the buffer positions. You can also use the "more" soft keys to quickly view the buffer positions in groups of forty characters.

Use the characters of the keypad to enter the text or numbers that you want printed in the buffer. Press the soft key beneath "ACCEPT" when the buffer contains the alphanumerics that you want printed.

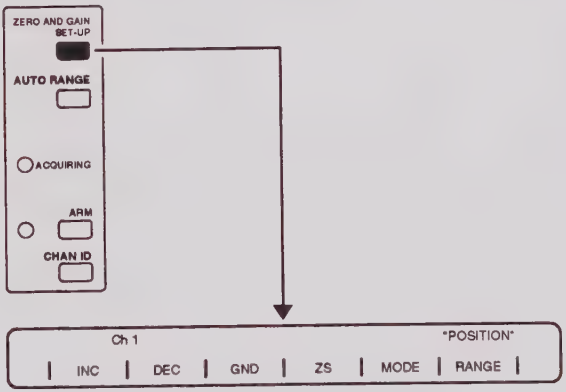
2-6.2 Using the on-demand annotation buffer

(continued)

5 Press the [FNC] key of the alphanumeric keypad each time you want the on-demand annotation buffer printed. The on-demand buffer will print once each time the [FNC] key is pressed.

Printing of the on-the-fly annotation buffer can also be prompted by using pin 7 of the rear-panel UTILITY D-shell. Host control command can also be used to initiate printing of the on-demand annotation buffer.

2-6.3 Shifting waveforms within their channels



To shift the position of the waveform or grounded trace within the channel:

1 Press the front-panel [ZERO AND GAIN SET-UP] key.

2 Use the "INC" or "DEC" keys to select the number of the channel that contains the waveform that you want to reposition.

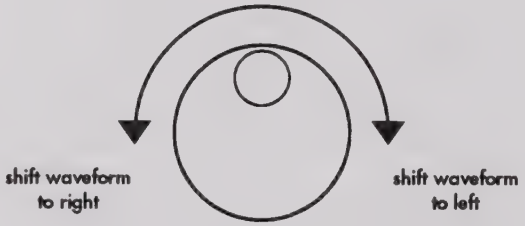
2-6.3 Shifting waveforms within their channels

(continued)

3 Notice that the word "POSITION" appears in the top line of the menu and that the ENCODER wheel's indicator light illuminates. These indicate that you can now shift the selected waveform within its channel.

Use the ENCODER wheel to shift the waveform in the direction that you want.

- Turn the wheel to the right to shift the waveform toward the left edge of the channel.
- Turn the wheel to the left to shift the waveform toward the right edge of the grid.

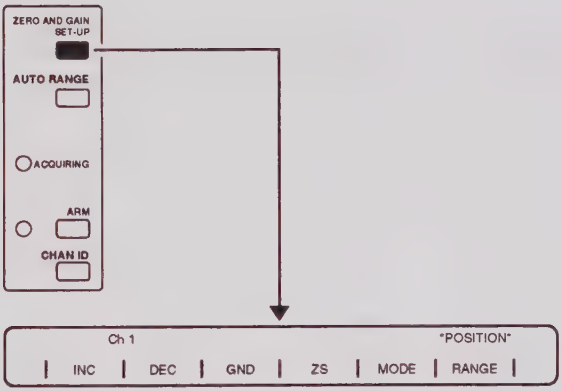


2-6.4 Changing the order in which channels are printed

If you should want to change the order in which the waveforms are printed across the chart simply rearrange the order of the banana-jack signal inputs.

Alternatively, you can use the USER CHART setup described on pages 2-24 through 2-27 to arrange the setup of your chart. The channel arrangement you have defined will appear when you record in the USER MODE (page 2-45).

2-6.5 Grounding waveforms



To ground a waveform trace on the chart:

1. Press the front-panel [ZERO AND GAIN SET-UP] key.
2. Use the "INC" or "DEC" keys to select the number of the channel that contains the waveform that you want to ground.
3. Press the "GND" key to ground the selected waveform. The GND menu selection will begin to flash indicating that the selected waveform has been grounded. When the "GND" key is pressed again, the waveform is no longer grounded.

2-6.6 Labeling each waveform with a channel identification number

When the DASH 8 is operating in any non-overlapped real-time mode and the [CHANNEL ID] key is pressed, a channel identification number is printed in each channel. The number that printed is the number of the channel. This is especially useful if channels have been rearranged and are no longer in numerical order.

2-6.6 Labeling each waveform with a channel identification number (continued)

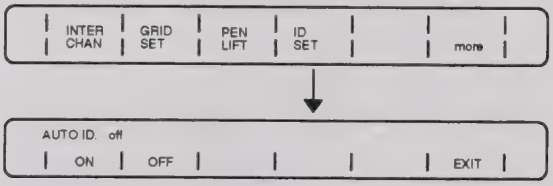
When the recorder is operating in an overlapped mode and the [CHANNEL ID] key is pressed, a channel identification number is immediately printed on waveform rather than simply in the channel. The number that is printed is the number of channel. This feature makes identifying overlapped waveforms easy.

2-6.7 Continuous printing of channel ID numbers

The DASH 8's AUTO ID feature causes a channel identification to be printed regularly and continually in each channel. If the recorder is working in an overlap mode, the ID number is printed on the waveform. If the recorder is working in a non-overlapped mode, the ID number is printed in the center of the channel.

Printing of the channel ID number is synchronized with and repeated with each printing of the caret that marks the beginning of the System Log.

To use the AUTO ID feature, press the [SYSTEM] key and go to the ID SET setup. Turn the feature on or off as desired.

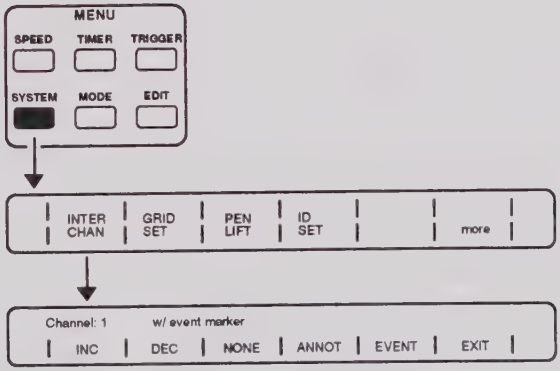


2-6.8 Using event markers to mark data of interest

The DASH 8 is equipped with a system event marker and eight interchannel event markers.

The system event marker is printed as a straight line just below the System Log. This event marker can be controlled either through the front-panel [EVENT] key, through pin 15 of the rear-panel UTILITY D-shell, or through host-control command. Host control of the event marker is discussed in the DASH 8 Host Control Manual.

The recorder's eight interchannel buffers can be configured to print alphanumeric data, event markers, or nothing at all. Follow the procedure below to select printing of event markers in the DASH 8's interchannel buffers.



1. Press the [SYSTEM] key and select the "INTER CHAN" setup from the resulting submenu.

2. Use the "INC" or "DEC" soft keys to select the number of the interchannel buffer that you want to configure.

2-6.8 Using event markers to mark data of interest

(continued)

3 Press the soft key beneath "EVENT" to choose printing of an event marker in the selected interchannel buffer. The selection takes immediate effect.

4 Select the remaining interchannel buffers and use the same procedure to choose printing of event markers.

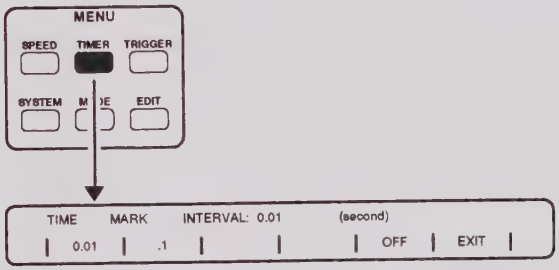
5 Use a switch closure or TTL Low to the appropriate pin of the UTILITY D-shell to cause the selected event marker to deflect to the left to mark data of interest.

UTILITY D-shell connector pin table

Pin	Description
1	Event 1
2	Event 2
3	Event 3
4	Event 4
5	Event 5
6	Event 6
7	Event 7
8	Event 8
9	External Trigger
10	External Speed
11	Remote Start/Stop
12	Ground
13	no connection
14	no connection
15	System Event

2-6.9 Printing trilevel timing marks

The front-panel [TIMER] key of the DASH 8 is used to print trilevel timing marks beneath the right edge of the grid. The intervals between trilevel timing marks are synchronous with the recorder's internal clock. Trilevel timing marks are printed at intervals of either of two base times: 0.01 second or 0.1 second.



Trilevel timing marks are differentiated by their lengths and by the intervals at which they are printed.

- The first level timing mark is printed synchronously with the selected base time. First level timing marks are 2mm long.
- The second level of the timing mark is printed at an interval of ten times that of the base time interval. Second level timing marks are 4mm long.
- The third level of the timing mark is printed at an interval of one hundred times the base time. Third level timing marks are 8mm long.

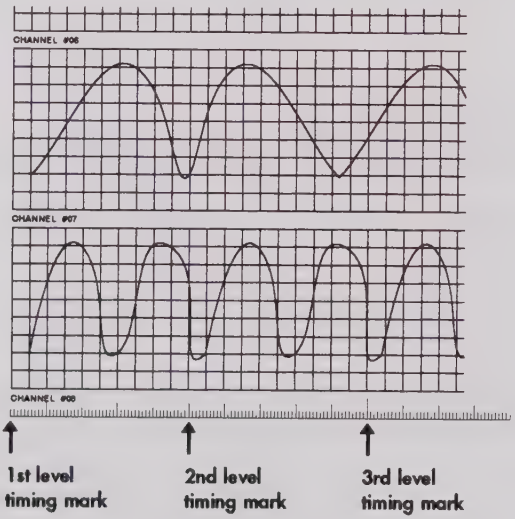
For example, if a base time of 0.1 second has been selected for the trilevel timing mark:

- a first-level timing mark will be printed every tenth of a second.

2-6.9 Printing trilevel timing marks (continued)

- a second-level timing mark twice the length of the first-level mark will be printed every seconds.
- a third level timing mark twice the length of the second-level mark will be printed every 10 seconds.

Typical trilevel timing marks are shown in the chart partially represented below.



To print trilevel timing marks:

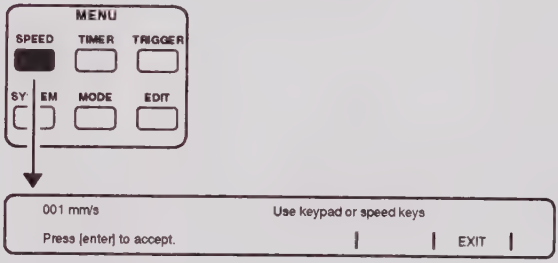
1. Press the front-panel [TIMER] key of the MENU group.
2. Press the soft key beneath the trilevel timing mark time-base interval that you want: either 0.01 second or 0.1 second.

The selected trilevel timing marks are immediately visible beneath the right edge of grid.

2-6.10 Using the [SPEED] key to change recording speeds

The front-panel [SPEED] key of the DASH 8 is used to specify any valid chart speed that might not be immediately available through the keys of the CHART SPEEDS group.

Pressing the [SPEED] key results in the following display.



Use the alphanumeric keypad to enter the speed you want to implement.

Press the [ENTER] key on the keypad to have the DASH 8 accept the speed.

Pressing "EXIT" before the speed has been entered aborts the speed change.

Maintenance 3

3-1

What is discussed in this section

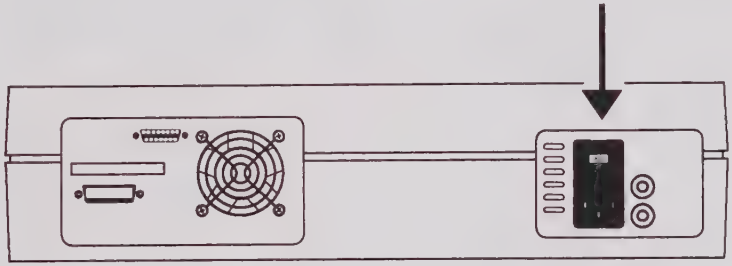
Maintenance of the DASH 8 is discussed in the following sequence:

- fuse changing
- cleaning the printhead
- cleaning the cooling fan filter
- replacing the printhead
- aligning the printhead
- disassembling the DASH 8
- installing or removing a battery pack

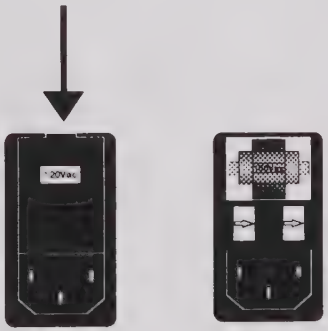
3-2

Changing fuses

1 On the recorder's rear panel, locate the power input receptacle/ voltage selection box.



2 With a small flat-head screwdriver, open the fuse block/voltage selection box to expose the fuses and the voltage selector.



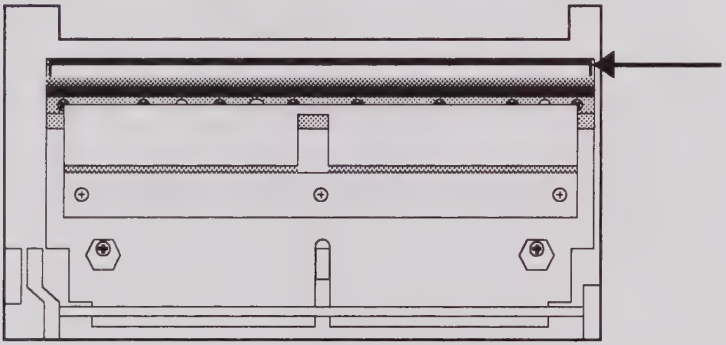
3 Remove the two fuse-holding fixtures from the fuse block.

Replace both fuses with fuses appropriate to the voltage that will be powering the recorder. Operation at 240VAC requires two 1.6A fuses. Operation at 120 VAC requires two 3.15A fuses.

3-3

Cleaning the printhead

For optimum performance, the print elements must be kept free of any debris or residue build-up. Cleaning the printhead refers to cleaning the hairline row of print elements that can be seen running across the top of the printhead.



At a minimum, clean the DASH 8's printhead after every ten hours of operation.

To clean the printhead, open the paper-chamber door and, on the underside of the door, locate the printhead mounted on the printhead plate assembly. Clean the printhead with a cotton swab dipped in isopropyl alcohol.

3-4

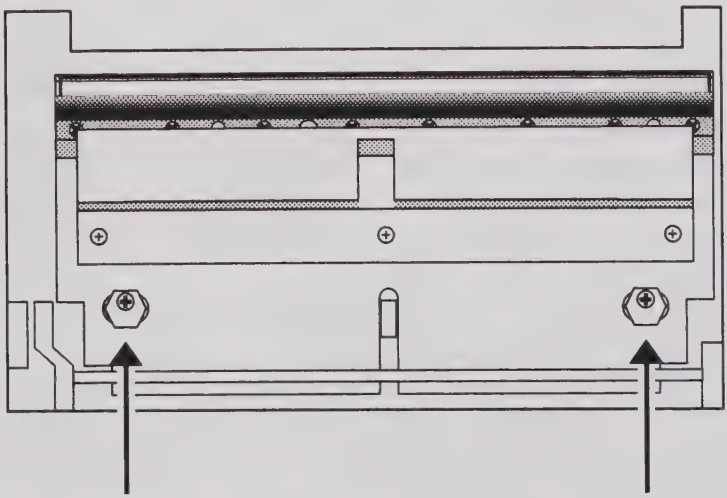
Replacing the printhead

You will find it useful to have the following tools ready for use during the printhead replacement procedure: a #1 Phillips head screwdriver with an overall length of 4" or less, a 1/2" open-end wrench, a 3/16 flat head screwdriver, and a pair of needle-nose pliers.

1 Open the paper-chamber door and locate the printhead plate assembly on the underside of the door.

2 Using a #1 Phillips head screwdriver, remove and set aside the two eccentric nuts that secure the printhead plate assembly to the paper-chamber door. The printhead is attached to the printhead plate assembly.

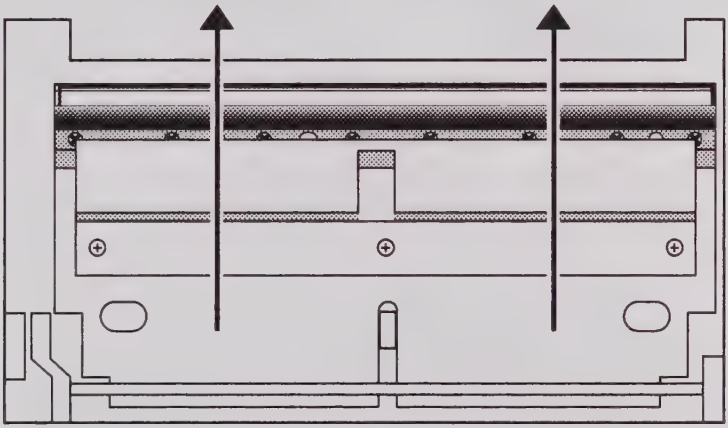
The printhead plate assembly is now held in place by being wedged between the paper-chamber door and the shaft that functions as the hinge of the paper-chamber door.



3-4

Replacing the printhead (continued)

3 Carefully free the printhead plate assembly with attached printhead by sliding the plate up and past the paper-chamber door shaft/hinge.



NOTE

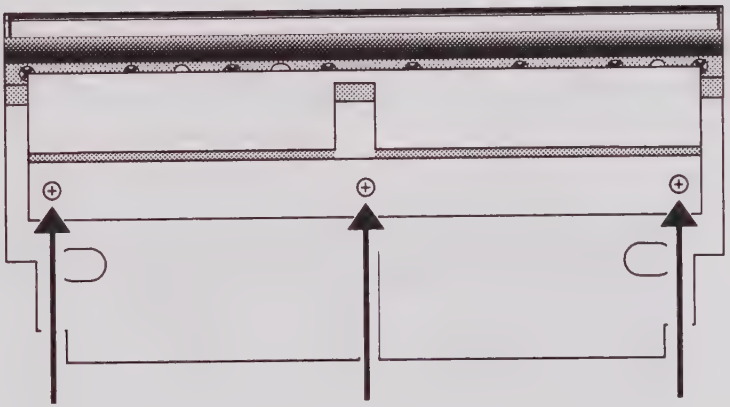
Four springs are located behind the printhead between the printhead plate and the paper-chamber door. When working the printhead plate free, these springs will be released. Ensure that the springs are not lost. When the printhead plate has been freed, remove the springs and set them aside.

4 Using a #1 Phillips head screwdriver, remove the three screws that secure the paper deflection bracket to the printhead plate. Set the screws and retaining bracket aside.

See the illustration at the top of the next page.

3-4

Replacing the printhead (continued)



5 Carefully unplug the printhead ribbon cable from the rear of the printhead plate assembly.

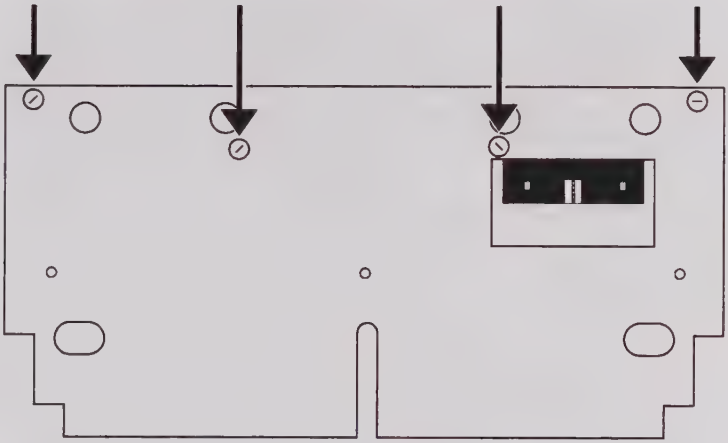
The printhead plate assembly is now completely detached from the recorder.

6 On the rear of the printhead plate assembly, use a 3/16 flathead screwdriver to remove the four screws that secure the printhead to the printhead plate. Set the screws and old printhead aside.

See the illustration at the top of the next page.

3-4

Replacing the printhead (continued)



7 Use a 3/16 flathead screwdriver and the four screws that secured the removed printhead to attach the new printhead to the printhead plate.

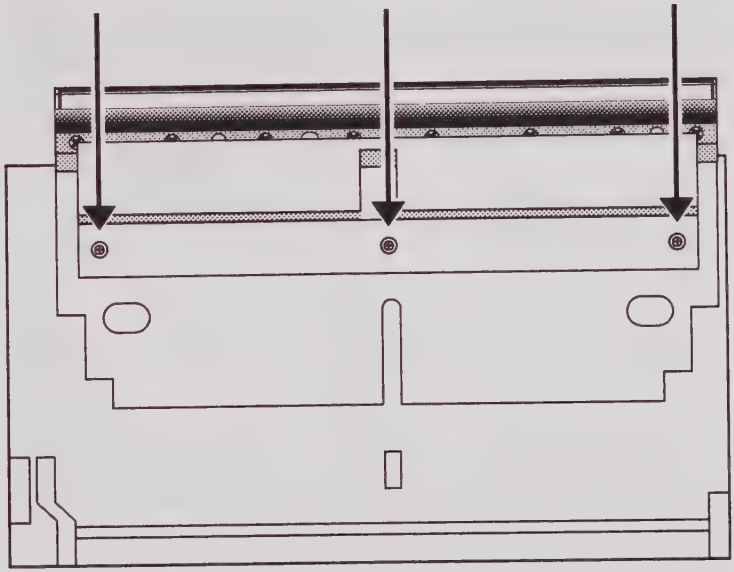
8 Return the printhead plate assembly with attached printhead to the underside of the paper-chamber door and reattach the printhead ribbon cable to the printhead. Ensure that the ribbon cable is fully plugged into the ribbon cable connection on the printhead.

9 Use a #1 Phillips head screwdriver to reinstall the paper deflection bracket on the front of the printhead plate.

See the illustration at the top of the next page.

3-4

Replacing the printhead (continued)

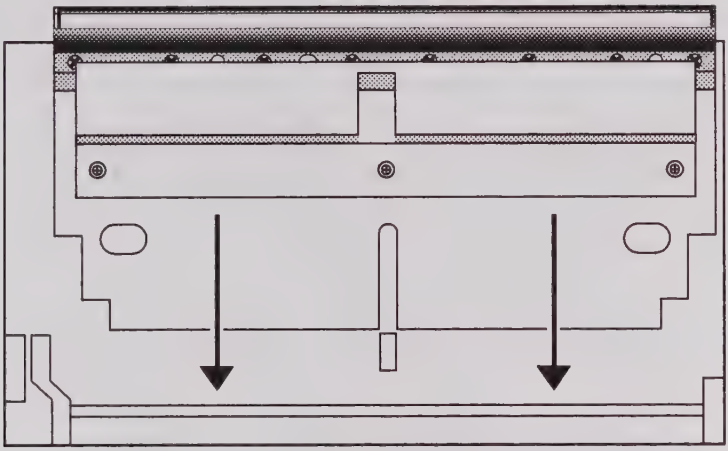


10 Slip the printhead plate assembly between the underside of the paper-chamber door and the shaft that functions as the hinge of the paper-chamber door.

See the illustration at the top of the next page.

3-4

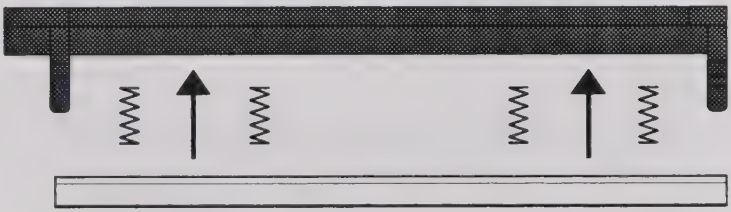
Replacing the printhead (continued)



11 Place the two eccentric nuts and a #1 Phillips head screwdriver next to the recorder within easy handling distance. You will need them nearby immediately after completing step 14 below.

12 Lower the paper-chamber door as if to close it until the printhead rests against the printhead platen.

Using a needle-nose pliers, carefully reinsert the four springs between the rear of the printhead and the underside of the paper-chamber door. Ensure that the springs are positioned in the holes provided in the rear of the printhead and the underside of the door.



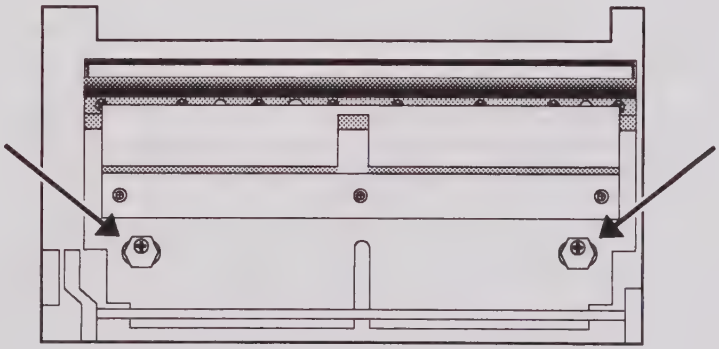
3-4

Replacing the printhead (continued)

13 Grip the printhead and paper-chamber door with one hand and exert enough pressure to compress the springs and bring the printhead plate with attached printhead and the paper-chamber door close together. This requires only minimal pressure.

14 Raise the paper-chamber door and, using a #1 Phillips head screwdriver, carefully reinsert the two eccentric nuts in position at the bottom of the printhead plate. Tighten the nuts in place firmly but not with excessive pressure.

This completes the printhead replacement procedure.



NOTE

After this printhead replacement procedure has been completed, the printhead print elements may need to be horizontally aligned with the printhead platen. The printhead alignment procedure is described immediately following this discussion in paragraph 3-6, "Aligning the printhead."

3-5

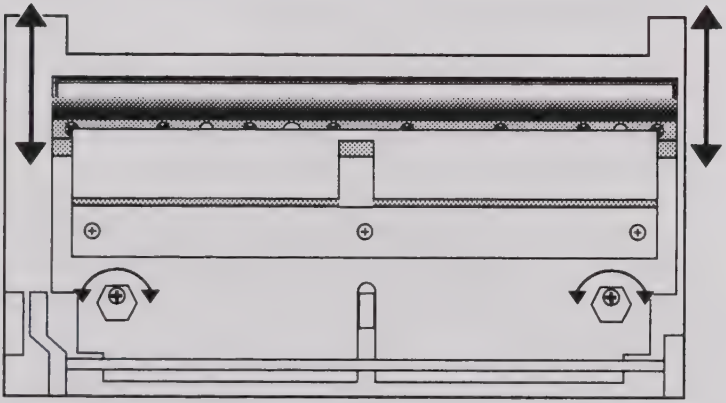
Aligning the printhead

Before leaving the factory, your DASH 8 was adjusted to provide optimum print quality.

For best printing quality, the active area of the printhead should be positioned at the crest of the printing platen. The active area of the printhead is actually a hairline-thin horizontal row of individual print element dots that run the length of the printhead.

Aligning the horizontal position of the printhead consists of nothing more than moving the printhead back or forth as necessary to get the print elements directly over the surface of the printhead platen.

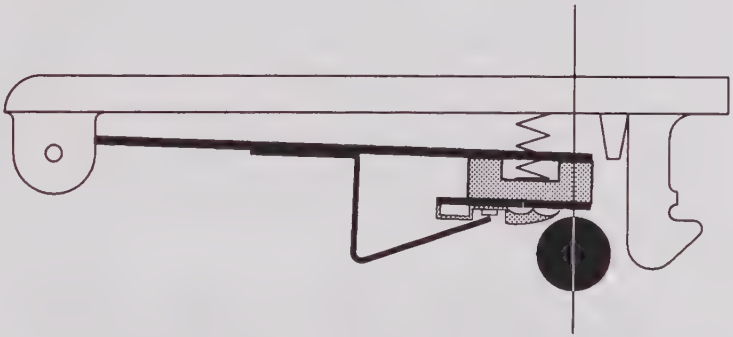
The eccentric nuts just below the printhead retaining bracket are used to adjust the horizontal alignment of the print elements. As each eccentric nut is rotated clockwise, the nut moves the end of the printhead in a relative "up" direction. As each eccentric nut is rotated counter clockwise, the nut moves the end of the printhead in a relative "down" direction.



3-5

Aligning the printhead (continued)

Use a 1/2" open-end wrench to adjust each eccentric nut to bring the printhead into horizontal alignment with the printhead platen. The printing elements should be positioned at the crest of the platen.



3-6

Disassembling the DASH 8

During the procedure given below, the two halves of the DASH 8 will be separated somewhat like opening a book. It will aid the disassembly procedure if you prepare a work area with approximate minimum dimensions of 40" wide and 20" deep.

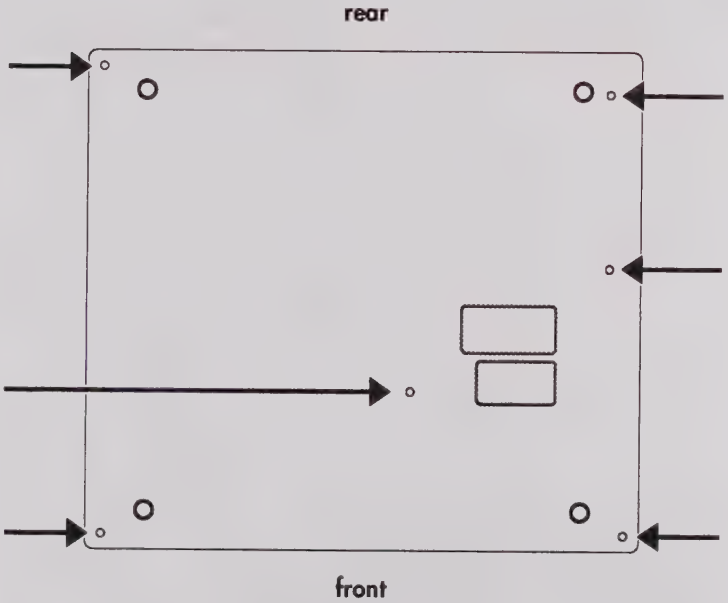
You will find it useful to have the following tools ready for use during the procedure: a #1 Phillips head screwdriver with a shaft length of 3" or less, a 3/16 flat head screwdriver, a pair of needle-nose pliers.

1 Orient the DASH 8 so that its bottom faces up and the rear of the recorder faces away from you.

3-6

Disassembling the DASH 8

2 Remove the six screws that secure the two halves of the recorder together.



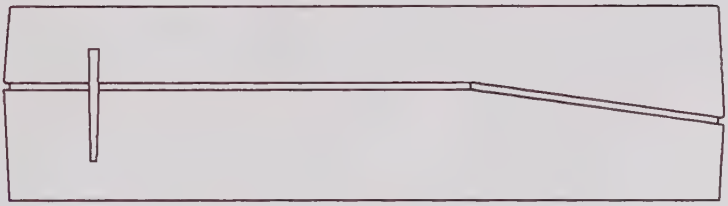
3 Carefully holding the two halves of the recorder together, set the DASH 8 right-side up.

4 Orient the recorder so that, as you face the DASH 8, its rear is to your left.

See the illustration at the top of the next page.

3-6

Disassembling the DASH 8 (continued)



5 Open the paper-chamber door.

6 Carefully lift the top half of the recorder and rotate it placing it to your right.

7 Remove the DASH 8's carrying strap.

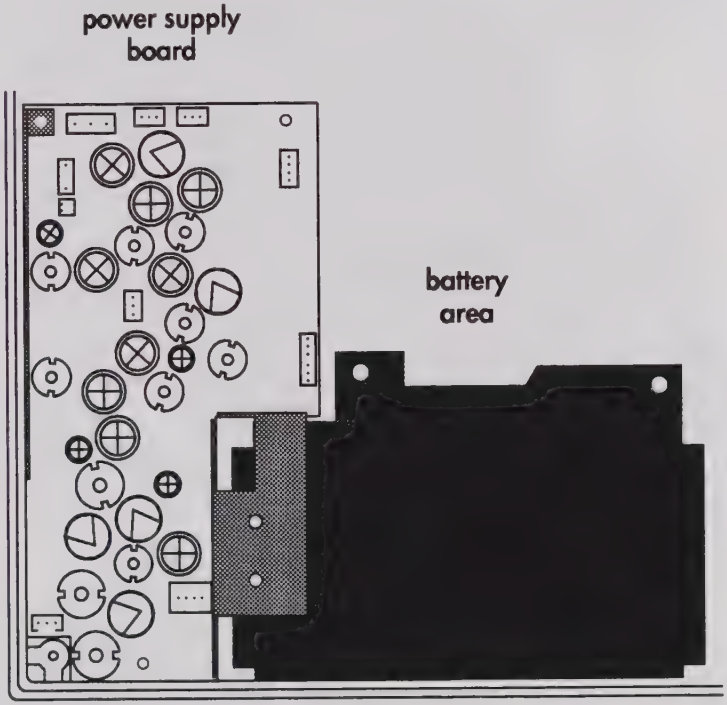
This completes the disassembly procedure.

3-7

Installing or removing a battery pack

1 Perform the disassembly procedure described in section 3-7, "Disassembling the DASH 8."

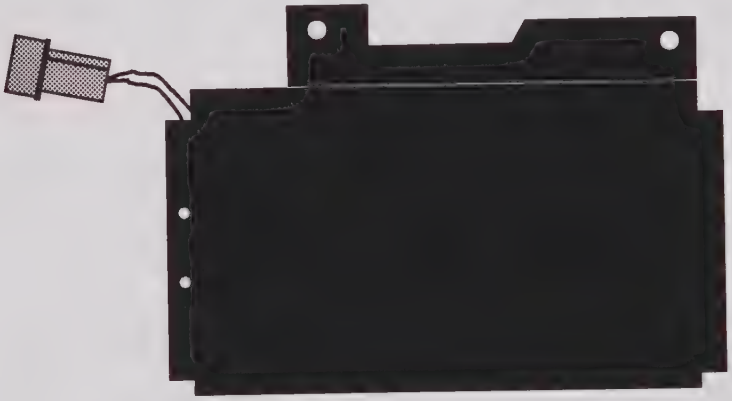
In the bottom portion of the DASH 8 case, locate the battery area and power supply board in the front left corner of the case. This is shown in a simplified view below.



3-7

Installing or removing a battery pack (continued)

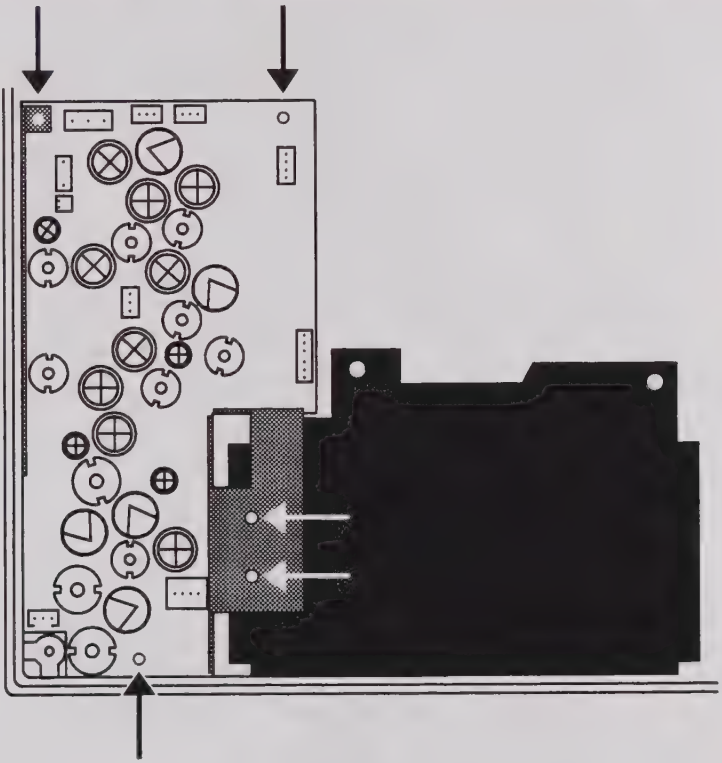
2 Disconnect the lead that connects the battery to the power supply board. The battery plug emerges from beneath upper left corner of the battery retaining. This is shown in a simplified view below.



3 Disconnect the five screws that secure the power supply board and set the screws aside. The location of the screws is shown in the illustration on the opposite page.

3-7

Installing or removing a battery pack (continued)

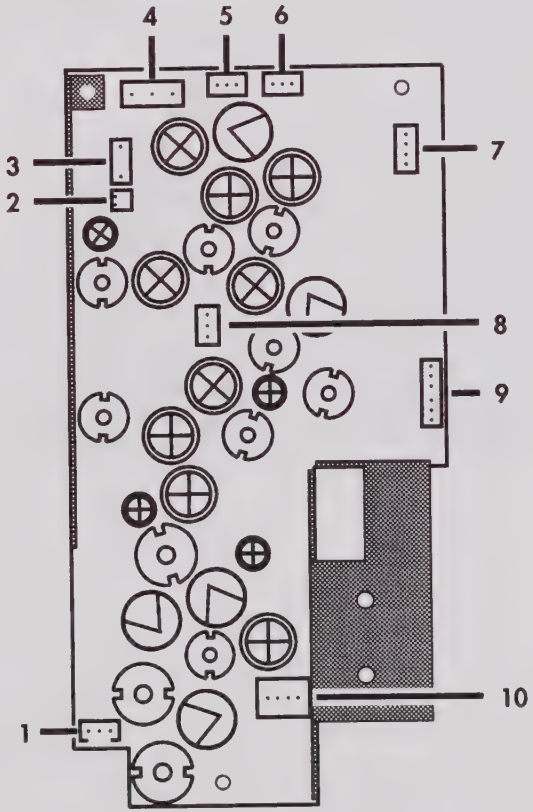


3-7

Installing or removing a battery pack (continued)

4 Disconnect the ten wiring harnesses that plug into the power supply board. Each harness is distinct from one another and cannot be wrongly insert into an incorrect connection.

For purposes of identification, the power supply board connections are shown in isolation and identified below.



3-7

Installing or removing a battery pack (continued)

Power Supply Board connections

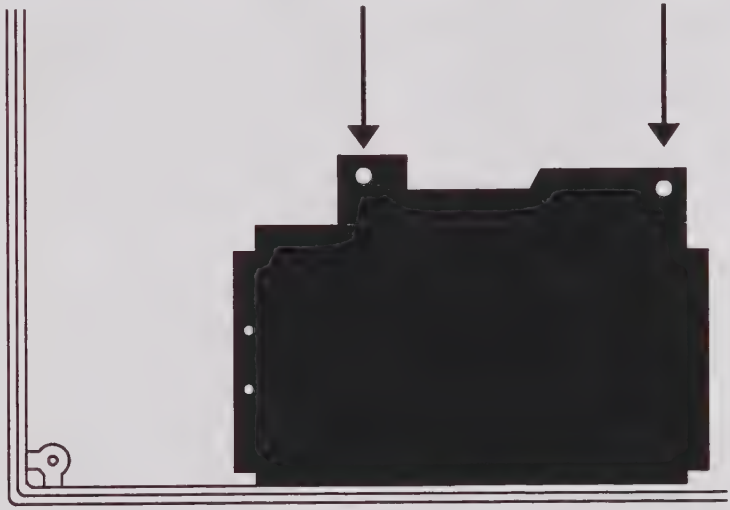
Connection	Description
1	LED harness
2	battery connector harness
3	power on/off harness
4	DC input harness
5	fan harness
6	fan harness
7	motor harness
8	±12 V harness
9	sensor connection
10	DC output harness

5 Remove the power supply board.

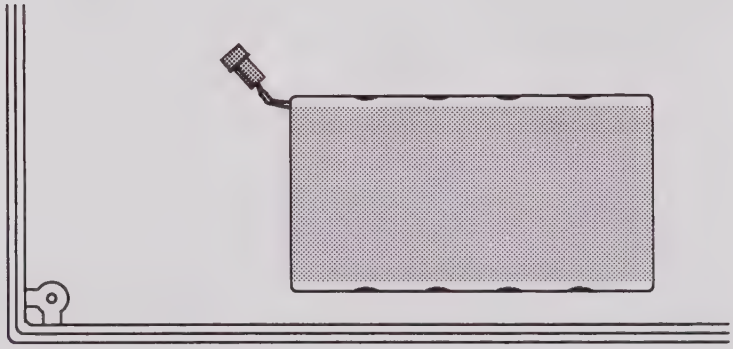
6 Using a #1 Phillips head screwdriver, remove the two screws securing the battery retaining plate to the bottom of the case. Set the screws aside. See the illustration on the next page.

3-7

Installing or removing a battery pack (continued)



7 Remove the battery retaining plate and remove the old battery pack. Insert the new battery pack. Note that the battery pack is positioned on its side with the connector in the upper left corner.



3-7

Installing or removing a battery pack (continued)

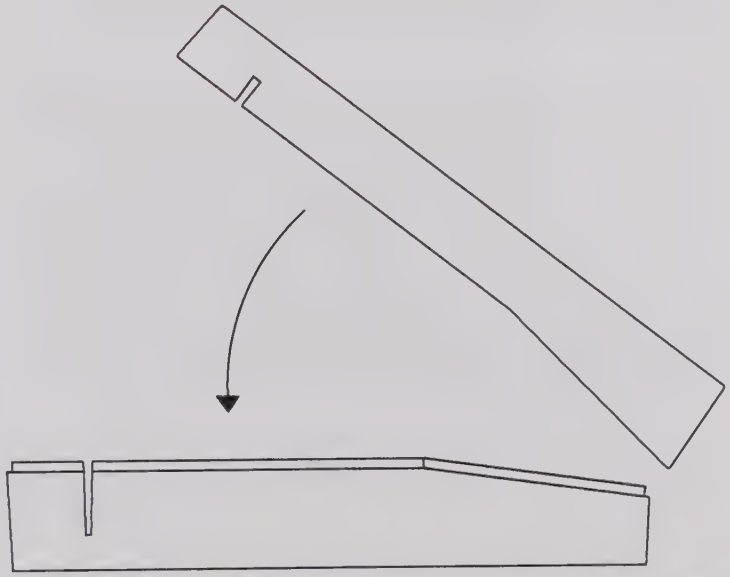
8 Reinstall the battery retaining plate ensuring that the battery lead protrudes from under the upper left corner of the plate. Space is provided for this purpose.

9 Reinstall the power supply board using the screws removed in step 3.

10 Reattach the ten connectors disconnected in step 4. The connectors are distinct from one another and will not fit into an incorrect connector slot.

11 Reinsert each end of the DASH 8 carrying strap in the two side slots in the lower half of the disassembled case.

12 With the paper-chamber door still open, place the top half of the recorder case on the lower portion of the recorder.



3-7

Installing or removing a battery pack (continued)

13 Gripping the halves of the recorder, carefully turn the DASH 8 upside down to expose the bottom of the case.

14 Reinsert and tighten the six screws that secure the two halves of the recorder together.

15 Return the recorder to its right-side up position.

This ends the battery removal/replacement procedure.

3-8

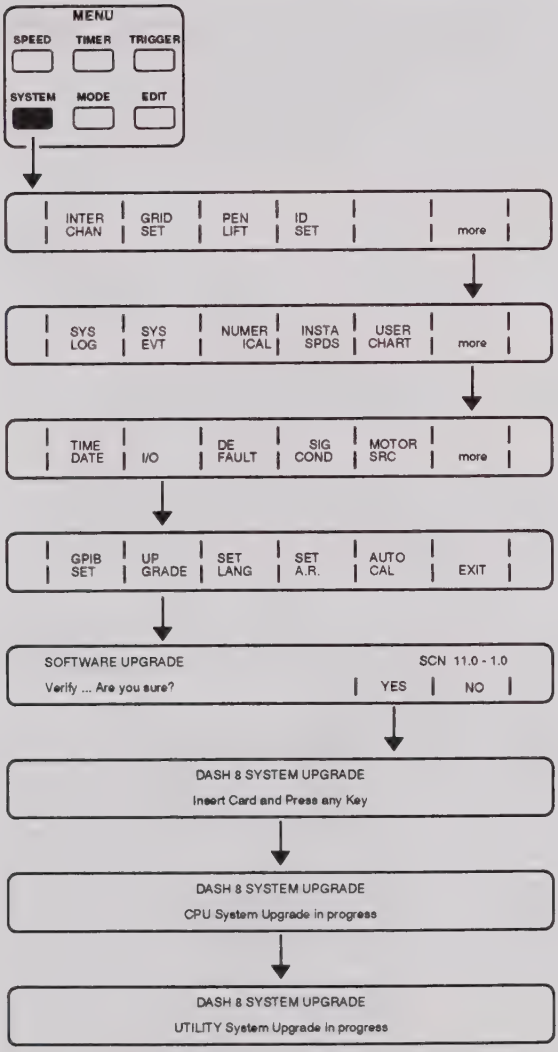
Upgrading operating system software

The upgrade process follows the menu flow shown on the next page. The process is explained and illustrated in the pages that follow.

Generally, software upgrades will be performed by an Astro-Med service technician. The procedure described here is provided as a service to those customers who may encounter the occasional need to perform the upgrade procedure themselves. The process of upgrading the DASH 8's operating system software requires an Astro-Med DASH 8 System Software Card. The card is inserted into the recorder's rear-panel RAM card slot and the input/output (I/O) setup is used to accomplish software downloads.The menu flow on the previous page is provided for reference during the upgrade procedure.

3-8

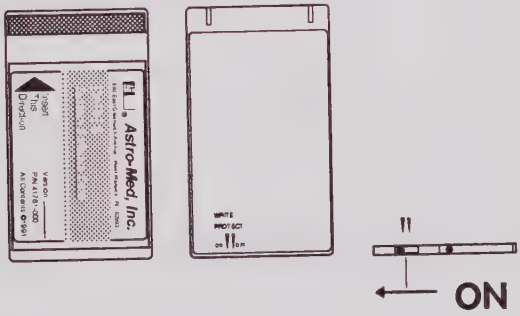
Upgrading operating system software (continued)



3-8

Upgrading operating system software (continued)

1 Ensure that the System Software card's write-protect tab is set to the ON position. This will protect the operating system software on the card from being accidently over-written and lost.

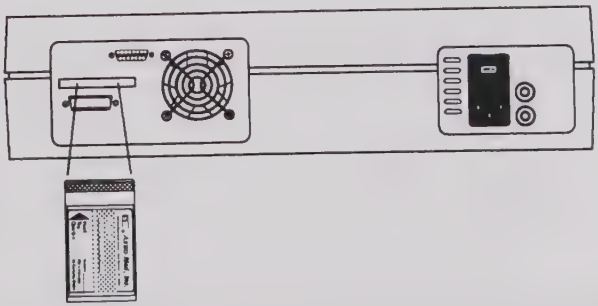


2 Press the front-panel [SYSTEM] key and proceed to the I/O setup.

3 In the I/O submenu, press the soft key beneath "UPGRADE."

To ensure that the current system software is not unintentionally replaced, the upgrade process gives you a final opportunity to confirm your intent to upgrade.

4 Press the soft key beneath "YES" and insert the the Astro-Med System Software Card into the rear-panel RAM card slot.



3-8

Upgrading operating system software (continued)

5 After the System Software Card has been installed, press any key to begin the upgrade process. Progress messages are automatically displayed. As the upgrade proceeds, a dynamic display of the percentage of software downloaded is shown. An automatic "Upgrade complete" message is displayed at the end of the process.

NOTE

After any software upgrade:

- enter the DEFAULT submenu (pages 2-32) and perform a system-wide default by pressing the soft key beneath "SYS."
- perform a recorder auto-calibration as described on page 2-32 of this manual.

3-9.1

If a system software upgrade attempt fails, the recorder may display any of a variety of error messages. In the event of a failure, Astro-Med's service department should be contacted at (401) 828-4000 for further information.

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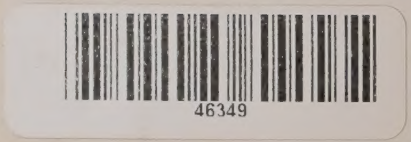
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